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PRIMUS VIR BOGORI NECNON TJIBODAE
INVESTIGATORIBUS EXTRANEIS LOCUM

AD

BIOLOGIAM TROPICAM INQUIRENDAM FECIT
OPUSQUE TREUBIANUM IN POSTERUM PERMANEBIT

EXEMPLUM

INVESTIGATORIBUS DIRECTORIBUSQUE DIGNISSIMUM

*We never can forget
 Those rubber boots, those bathing suits,
 And that collecting net
 Those sings and things will soon take wings
 But thru the coming years
 Whate'er the scene, dear formaline
 Will fill our eyes with tears,
 Whate'er the scene, dear formaline
 Will fill our eyes with tears*

WOODS HOLE MARINE BIOL LAB SONG

*Oh the wondrous laws which bind
 Living things of every kind,
 And control their distribution in the lake,
 Temperature and CO₂
 Pressure, light, and ions too,
 All determined by the tests we've learned to make*

UNIV OF MICHIGAN BIOL STA SONG

*Oh we are the students of M B L, and a jolly gang
 We dig, we cut, we fish around from morn'g 'til way evn'
 We waddle the flat pond, and tickle the lobster's toes
 And wonder why old Nereis has warts upon his nose
 Wig, wig, wig, wig, waggle old Nereis goes
 Tick, tick, tick, tick, tickle the Lobster's toes,
 Exopodite, endopodite, basipodite as well
 What happens to these animals I'd surely hate to tell*

CHARLTON, SPEIDFL & KINDRED (1919)

*I want to go back to Douglas Lake
 The dear old camping ground,
 Back to the mess hall on the hill,
 Back to the fun in ladyville,
 Back to the labs with all their joys
 In which we did partake,
 I want to go back, I've got to go back
 To Douglas Lake*

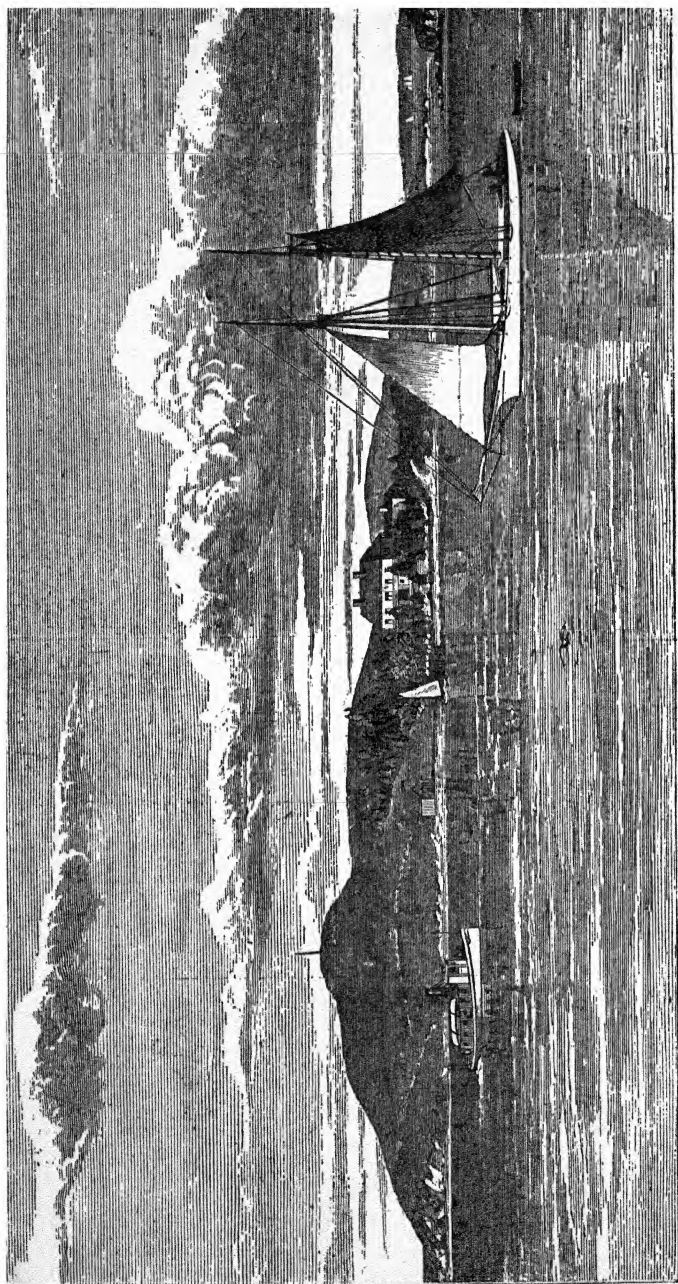
UNIV OF MICHIGAN BIOL STA SONG

*There are bugs that make us happy,
 There are bugs that make us sore,
 There are bugs that spoil our dispositions
 Till we never want to see them more,
 There are bugs so very complicated
 That their heads from tails we cannot tell
 But the bugs that fill our hearts with sunshine,
 Are the Big Bugs from M B L*

WOODS HOLE MARINE BIOL LAB SONG

• Chronica Botanica, Volume 9, Number 1 •

BIOLOGICAL
FIELD STATIONS
of the WORLD



AGASSIZ'S SCHOOL ON PENIKESSE ISLAND (*Contemporary woodcut from Harper's Weekly*).—For reports of this early American laboratory, founded in 1873 by AGASSIZ, cf. bibliography, p. 11. For a recent interesting account see L. C. CORNISH 1943, *Sci. Mo.* 62:315-321.

BIOLOGICAL FIELD STATIONS

of the

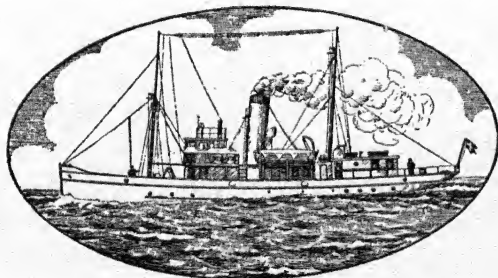
WORLD

by

HOMER A. JACK

*Ph. D. (Cornell), B. D. (Meadville); Executive Secretary, Chicago Council
Against Racial and Religious Discrimination; Sometime Lecturer,
Athens College, Athens, Greece; Sometime Minister,
Unitarian Church, Lawrence, Kansas.*

"I have made use of the term 'biological station' in preference to those in more common use for the reason that my ideal rejects every artificial limitation that might check growth or force a one-sided development. I have in mind, then, not a station devoted exclusively to zoology, or exclusively to botany, or exclusively to physiology; not a station limited to the study of marine plants and animals; not a lacustral station dealing only with land and freshwater faunas and floras; not a station limited to experimental work, but a genuine biological station, embracing all these important divisions, absolutely free of every artificial restriction."



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The purpose of this study is to synthesize and present heretofore scattered and unpublished materials describing and comparing the biological field stations of the world. If this purpose is partially fulfilled, prospective students and investigators will have a guide to aid them better in selecting a station in which to study or conduct research work. In addition, it is hoped that this study will be of some benefit to the directors of biological stations, since it may show them how their fellow-administrators are solving some of the problems attendant to the efficient organization of these institutions in many parts of the world. Finally, if a theoretical justification for studying these institutions need be given, it is merely that they have loomed large in the progress of biological instruction and research in the past and—providing they retain their adaptability—there is every reason to believe that they will remain equally important in the future.

Although biological stations have been in existence for more than eighty years, there is a paucity of literature about them. Biologists have been prone to leave the study of such institutions to others who rarely have the insight, if the interest, to make extensive analyses (20)*. The few materials which have been published about biological stations fall into several categories. 1, articles on the functions of these institutions, especially by ANTON DOHRN (1), Professor C. O. WHITMAN (2), and most recently by Professor PEARSE (3); 2, articles describing a particular station; 3, articles on several stations of a region or functional group; and 4, articles in the form of a directory of the stations in larger political units.

The first directory for any large political or geographical area was published in 1893 by BASHFORD DEAN (4). This consisted of a discussion of the marine laboratories of Europe. It was followed in 1898 by RENÉ SANN's account (5) of the biological stations of the world. In 1899 HENRY WARD (6) published a paper on the freshwater biological stations of the world and in 1910 CHANCEY JUDAY (7) wrote an account of European biological stations.

The first extensive study of biological stations was made in 1910 by Professor KOFOID in his bulletin on the "Biological Stations of Europe" (8). In 1927 LENZ (9) published his valuable directory of limnological laboratories and in the same year MAGRINI (10) issued his list of institutions occupied with the study of the sea. In 1928 the General Biological Supply House of Chicago began to publish its annual booklet on "Biological Field Work" (11) at North American stations. Professor T. W. VAUGHAN in 1937 issued his important "Catalogue of Institutions Engaged in Oceanographic Research" (12) and in that same year the author's unpublished study (13) on the biological field stations of the United States was completed. CHRONICA BOTANICA (14) in 1938 published a world list of scientific institutions which contained a more complete enumeration of biological stations than had ever appeared in the editions of "Minerva," "Index Generalis" or "Index Biologorum." In 1940, the author published a short description of the United States stations in "The American Biology Teacher" (15) and a series of articles on the European stations in "The Collecting Net" (16). Also in 1940 the author completed his unpublished manuscript on "The Biological Field Stations of the World" (17), of which this study is a part.

In addition to reviewing the existing literature, the author tried to study these institutions first-hand. Besides being a student and investigator at two stations for five summers, the author attempted to visit as many of these institutions as his time and resources permitted. Seventy-nine stations in eighteen countries in Europe, North Africa, and North America were visited by the author between 1937 and 1941. These visits and interviews (18) were supplemented by questionnaires in English and French to the directors of the stations not visited.

It must be emphasized that, with few exceptions, the descriptive and analytic accounts of the biological stations given in this study are corrected to 1940—before the second World War became world-wide. As the war progressed, many of these institutions greatly curtailed their activity and even suspended operation for the duration

* Notes and references will be found at the end of this introduction and at the end of each part of the first section of this account.

of the war. Indeed, a few stations were casualties of the war (19). Despite these changes wrought by the war, it has been thought useful for biologists and other scientists to have a picture of the biological stations of the world at perhaps the peak of their operation (1939-40). Thus even before the war is over or sectional armistices are declared, information on these institutions will be in the hands of those who, as students, investigators, and administrators, will be responsible for helping to make them again serve science and mankind.

Many biological stations normally print descriptive catalogues giving seasonal or up-to-date information on the research and instructional facilities available. Prospective students and investigators are urged to send for such a catalogue and correspond with the director before making definite arrangements to attend any station. If desired, the author through one of the CHRONICA BOTANICA publications will continue to act as a clearing house for information about these institutions. And if there is a demand, perhaps a second, post-war edition of at least the descriptive portion of this study can be issued.

The author is under deep obligation to all those who have helped to make this study possible, especially to Professors EDWIN CONKLIN, E. A. ANDREWS, and JACOB REIGHARD who, as patriarchs of biological field work in America, have given him, valuable historical materials; to Professors E. LAURENCE PALMER, ALBERT HAZEN WRIGHT, and LEONARD S. COTTRELL, JR., of his graduate committee at Cornell University; to Professors ROBERT E. COKER and GEORGE R. LARUE who, as former directors of the Allegany School of Natural History and the Biological Station of the University of Michigan respectively, accepted the author as a student in their institutions before he matriculated in college, and to Dr. and Mrs. FRANS VERDOORN, without whose aid and encouragement this study could not have been published.

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Above all, the author is deeply indebted to his parents, CECILIA and ALEXANDER JACK, who sought in every possible way to give him opportunity for study and travel. To them, this study is dedicated

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References and Notes:—(1) The foundation of zoological stations. *Nature* 5:277-80, 437-40, 1872. Also, Report of the committee . . . for the foundation of zoological stations in different parts of the globe. Report of the British Association for the Advancement of Science 1873 408-12, 1874.—(2) Some of the functions and features of a biological station. *Science* 7:37-44, 1898.—(3) A. S. PFARSE: Marine biological stations. *Tennessee Academy of Science* 17 (4):345-47, 1942.—(4) Notes on marine laboratories of Europe. *American Naturalist* 27:625-37, 697-707, 1893. Also this article may be found in the Report of the Smithsonian Institution for 1893, pp. 505-19, 1894.—(5) Les laboratoires maritimes de zoologie. *Revue de l'Université de Bruxelles* 3:23-47, 121-51, 203-35, 1898.—(6) The freshwater biological stations of the world. *Science* 9:497-508, 1899. Also this article may be found in the Report of the Smithsonian Institution for 1898, pp. 499-513, 1899.—(7) Some European biological stations. *Transactions of the Wisconsin Academy of Sciences, Arts, and Letters* 16:1257-77, 1910.—(8) CHARLES ATWOOD KOFOD: The biological stations of Europe. *United States Bureau of Education Bulletin* 1910 (4):1-360, 55 pls, 48 figs, 1910.—(9) F. LENZ: Limnologische Laboratorien. *Handbuch der Biologischen Arbeitsmethoden* 9:2(1):1285-1368, 1927.—(10) G. MAGRINI: Instituts et laboratoires s'occupant de l'étude de la mer. *Conseil International de Recherches, Union Géodésique et Géophysique Internationale, Section d'Océanographie, Bulletin* 7:1-115, 1927.—(11). This appeared in 1928, 1929, 1930, 1931, 1932, 1934, 1935, 1937. Mimeographed lists of the biological stations of the United States and Canada were issued by this supply house in 1938 and 1939. In 1940 the list appeared in *Turtlox News* 18(3):49-51.—(12) *In International aspects of oceanography* (T. W. VAUGHAN and others). Washington:

National Academy of Sciences. 1937, pp. 73-225. — (13) HOMER A. JACK. Biological field stations—their history, organizations, educational contributions, and conservation relations. 196 pp., 26 figs., 37 tables. (Unpublished thesis, Cornell University Library). 1937 — (14) FRANS VERDOORN (*ed.*): World list of institutions, stations, museums, gardens, societies, and commissions. *Chronica Botanica* (Leiden) 4(4-5) 301-83, 1938 — (15) HOMER A. JACK: Close to nature: biological field stations. *The American Biology Teacher* 2:141-45, 180-83, 3 figs, 1940. — (16) HOMER A. JACK. The biological field stations of Europe. *The Collecting Net* (Woods Hole) 15:5-6; 25, 31-33; 45, 51-52; 70-71; 96-98; 117-18; 137-38; 152-53; 184-86; 206-08, 1940 — (17) HOMER A. JACK: The biological field stations of the world—A comparative and descriptive study 1,001 pp., 114 tables, 4 plates. (Unpublished thesis, Cornell University Library). 1940. This may be obtained from the Cornell University Library through inter-library loan — (18) Cf. HOMER A. JACK: Language difficulty *Science* 89:558. 1939 — (19) "During the recent air raids of Plymouth, the Laboratory of the Marine Biological Association suffered severely. The buildings, though still standing, have sustained heavy damage. All windows except a few on the south side of the top floor of the main building have gone; ceilings are down, doors wrenched off, and much structural damage caused by the blast. The director's house was completely burned out. The library, very fortunately, is intact except for the loss of windows and the skylight, and it has now been made waterproof. . . . The Easter class house will no doubt have to be rebuilt, but most of the roof remains. Other buildings, including the dogfish house, director's garage and stores, and the constant temperature rooms, have all sustained damage. The tanks on the north side of the Aquarium burst and the supply pipes broke, but it is hoped that some part of the circulation may be restored before very long. . ." (*cf.* *Science* 93 445) — (20) An outstanding exception is *The Woods Hole Marine Biological Laboratory*, by FRANK R. LILLIE. University of Chicago Press, 284 pp., 1944

The Purpose of Biological Stations: — A biological field station may be considered as any institution which offers field instruction or research in one or more of the theoretical biological sciences and is a separate administrative unit located in the field. In the actual practice of the institutions, the pendulum has swung between research and instruction several times. And the problem has always been, as Professor C. O. WHITMAN posed it in 1893, "to combine the two [instruction and investigation] in such relations that each would contribute most to the same end — the advancement of science".

Nineteenth Century Stations. — In the nineteenth century, three principal types of biological stations evolved. The first kind of station to develop in Europe was the seaside laboratory and aquarium. Facilities were furnished for marine research, with a public aquarium being maintained principally to subsidize the research work of the institution. The Zoological Station of Naples fell into this class. Its founder, Dr ANTON DOHRN, rightfully called it "a battlefield where all the different zoological armies [systematists, anatomists, physiologists, and embryologists] may meet and fight their common adversaries [error and ignorance]"².

Quite opposite in purpose was the seaside school of natural history which was the first kind of station to appear in America. Its aim was to offer marine instruction to students and teachers. With the establishment of this type of station, of which LOUIS AGASSIZ's Anderson School of Natural History was representative, the battle royal began. Professor E. RAY LANKASTER, for example, wrote contemptuously in 1880 of AGASSIZ's venture, "the spasmodic descent upon the seacoast in a summer vacation . . . is a delightful thing . . . but it is not in this way that the zoology of today can be forwarded"³.

Toward the end of the nineteenth century, a practical compromise was reached in this controversy with the rise of the third kind of station, the

so-called marine observatory. Here both marine research and instruction were combined to varying degrees. The Marine Biological Laboratory at Woods Hole, Massachusetts, was a representative of this type of station. Professor WHITMAN, its director, realistically described its practice when he said, "instruction . . . was accepted more as a necessity than as a feature desirable in itself. The older ideal of research alone was still held to be the highest, and by many investigators was regarded as the only legitimate function of a marine laboratory"⁴.

Twentieth Century Stations.— It had been occasionally implied that biological stations made their maximum contribution to the progress of biology during the nineteenth century and that in the twentieth century they would decline. Not only have these institutions survived, but they have flourished, principally due to their adaptability from nineteenth century patterns to twentieth century needs. The typical biological station of the twentieth century has been organized to encourage research and instruction in one or more of the biological sciences by offering facilities for these types of work in one or more kinds of environments. This emphasis on various environmental conditions, in addition to the seaside, was envisaged by Professor WHITMAN, "I have in mind . . . not a station limited to the study of marine plants and animals; not a lacustral station dealing only with land and fresh-water faunas and floras . . . but a genuine biological station, embracing all these important divisions"⁵. In addition to exploring new types of biological environments, typical biological field stations have often sponsored actual research projects. Also there has been a new appreciation of the importance of instruction. As Professor WHITMAN prophetically stated, "with increase and specialization in science the investigator himself becomes more and more dependent upon the instruction which he draws not only from books and journals, but also directly from his colleagues and his pupils. . . We could not wisely exclude instruction [from biological stations] even if made free to do so by an ample endowment"⁶.

Despite the rise in the twentieth century of the typical biological station which offers both research and instruction, a number of contemporary institutions have confined themselves either to research or instruction. The biological research station confines itself solely to providing opportunities for research in addition to carrying on research projects of its own. Thus Dr. REINHARD DOHRN re-emphasized the original purpose of the twentieth century Zoological Station of Naples, "It was founded to enable naturalists to carry on their studies with the utmost economy of time, energy, and money. This is still, in my opinion, its fundamental *raison d'être*"⁷. Opposed to the biological research station is the biological nature camp, an institution largely American in origin. Its purpose is to train students in elementary field biology (*i.e.*, nature study).

Quantitatively, it is estimated that about one-half of the contemporary biological stations in the world are biological research stations, offering no facilities for instruction. About two-fifths of the world's stations offer both facilities for instruction and research, while about one-tenth of these institutions offer instructional facilities only. For the stations in the United States, the proportion differs: slightly less than one-half are typical biologi-

cal field stations offering both instruction and research; one-fourth are biological research stations; and almost one-third are biological nature camps.

Perhaps a case could be made for the relationship between the longtime political and educational philosophies of a country and the purposes of the biological stations within its borders. It is worth noting that some of the democracies with a tradition for popular education emphasize formal instruction at the biological stations within their borders (*e.g.*, three-quarters of the United States stations and more than two-thirds of the British stations), while some political areas without a long democratic tradition emphasize research (*e.g.*, more than one-half of the German stations, more than four-fifths of the Russian stations, and all of the Italian stations).

References — (1) *Pop Sci Mon* 42:459-71, 1893 — (2) *Rept. Brit. Assoc. Advan. Sci.* 1873:408-12, 1874 — (3) *Nature* 21:497-99, 1880 — (4) *Science* 7:37-44, 1898. — (5) *Ibid.* — (6) *Ibid.* This was reaffirmed forty years later by the trustees of the Marine Biological Laboratory. Cf. FRANK R. LILLIE. *The Woods Hole Marine Biological Laboratory*. University of Chicago Press, p. 92, 1944 — (7) *Nature* 113:449-50, 1924

The History of Biological Stations:—From the incomplete historical material available, it appears that the first biological station—as the term has been previously defined—was established in 1859 at Concarneau, France. Earlier in the nineteenth century, biologists came to recognize the value of staying in one place long enough to be able to study living materials in their natural environment. As Professor R. LEGENDRE said, “Bientôt, la simple récolte et la seule dissection ne suffirent plus”¹. In the eighteen thirties some Swedish naturalists established what Professor CHARLES A. KOFOID called “an impromptu summer biological station”². In 1843 at Ostend, Belgium, Professor P.-J. VAN BENEDEN founded what RENÉ SAND³ considered the first biological station in the world. LEGENDRE likewise said that this was “le premier centre d’études maritimes,”⁴ although KOFOID⁵ considered it as merely a kind of formalized seaside excursion and not the first biological station in the world. In that same decade Professor CARL VOGT made several unsuccessful attempts to establish a biological station and in 1848 Professor VALENCIENNES, an associate for a time to Baron CUVIER, began to explore the coast of Brittany for biological specimens. His efforts resulted in the establishment, in 1859, by Professor J. J. COSTE of what exists today as the Laboratory of Marine Zoology and Physiology of the College of France at Concarneau. Fourteen years later, the first station was founded in North America: LOUIS AGASSIZ’s Anderson School of Natural History on Penikese Island⁶. About the same time Dr. ANTON DOHRN founded the Zoological Station of Naples.

Their Increase.—The biological station idea spread swiftly and in many directions from its original centers in northwestern France (Concarneau) and in northeastern United States (Penikese Island). In the decade ending in 1880, sixteen biological stations were established, scattered between Sweden and the Black Sea in Europe and Illinois and Virginia in the New World. And by 1888 both the Marine Biological Laboratory at Woods Hole, Massachusetts, and the Laboratory of the Marine Biological Association at Plymouth, England, were in operation. The greatest number of

field stations were founded in the decade ending in 1930, when seventy new ones were established. Although these institutions have almost continuously been abandoned, there has been a net increase in the number of new stations established each decade, with a notable lessening of this increase in the decade including the first World War and the decade after the depression of 1929.

Their Founders. — Biological field stations have been established by many different types of individuals and institutions. Although most biological stations exist, at least in part, to aid scientific research work, scientists themselves have not always had the financial resources to establish these institutions. There have been a few scientists (*e.g.*, ANTON DOHRN or ALBERT I, Prince of Monaco) who have been able to use their private fortunes to build up biological stations. Less wealthy scientists have had to use their personalities to persuade others to give. Both royalty (*e.g.*, KING FERDINAND I of Bulgaria) and business men (*e.g.*, JOHN ANDERSON) have been patrons for the establishment of these institutions.

Most biological stations, however, have been established by the help of an institution or special committee, with some one scientist taking the administrative initiative. A list of the types of institutions which have aided in the establishment of biological stations include governmental departments (*e.g.*, Danish Ministry of Agriculture), national scientific institutions (*e.g.*, Carnegie Institution of Washington), national scientific societies (*e.g.*, Netherlands Zoological Society), universities (*e.g.*, University of Kiel), local institutions and societies (*e.g.*, Berlin Museum), and colleges (*e.g.*, South Dakota State College). Occasionally special committees have been founded for the express purpose of starting a biological station. These have been international (*e.g.*, Jungfrauoch Scientific Station), national (*e.g.*, Freshwater Biological Association of the British Empire), and local (*e.g.*, Liverpool Biological Committee).

More than one-half of the stations in the United States have been established by universities or colleges. There is apparently a world-wide trend away from the foundation of these institutions by private individuals. This might be explained by the fact that the organization of a field station involves greater expenses than formerly, when an individual scientist with a few students, much enthusiasm, and little equipment could establish a station or induce a rich patron to finance one.

Their Development. — Once a station is founded, it is naturally often not equipped to cope with all the problems which it often must face. Several stations have experienced considerable delay between the time they were started and the time their instruction or research program was begun. And being very dependent upon the immediate natural environment, some stations have had to move from their original sites, because of the unfortunate choice of the original site or because of the encroachment of civilization.

Their Abandonment. — Biological stations have been abandoned for a number of reasons. The most common causes for discontinuance have been the death of the founder or director (*e.g.*, LOUIS AGASSIZ's death soon brought an end to the Anderson School of Natural History), fire (*e.g.*, Cornell University Biological Station), marine disaster (*e.g.*, the wreckage

of the *Pourquoi Pas?*), war (*e.g.*, Royal Hungarian Marine Biological Station), curtailment of funds (*e.g.*, The Biological Station of the United States Bureau of Fisheries at Woods Hole), and personal disagreements (*e.g.*, Mountain Laboratory of the University of Utah).

Since the first biological station was founded, at least ninety of these institutions — approximately one out of four established — have gone out of existence. The life span of abandoned stations has varied widely. One institution (*i.e.*, The Biological Station of the United States Bureau of Fisheries at Woods Hole) closed after being in operation fifty-one years. Others (*e.g.*, Lake Cooper Biological Laboratory) have closed their doors after one season. The average length of life of the abandoned stations has been about sixteen years. The average length of life of those stations existing in 1940 was about twenty-six years, with the oldest founded in 1859 and the youngest founded in 1940.

References — (1) *Revue Scientifique* 70:750-53, 1932. — (2) U. S. Bur. Educ. Bull. 1910(4) :1-360, 1910. — (3) *Rev. Univ. Bruxelles* 3:23-47, 121-51, 203-35, 1898. — (4) *Revue Scientifique*, *op. cit.* — (5) U. S. Bur. Educ. Bull., *op. cit.* — (6) *cf.* Harper's Weekly 17:701-02. *Popular Science Monthly* 40:721-29. *Nation* 17:174-75. *Ibid.* 31:29. *American Naturalist* 32:189-96. *Nature* 6:34. *Ibid.* 8:454-55. *Ibid.* 11:167-68. *Ibid.* 21:497-99. *Ibid.* 31:174-75. *Science* 58:273-75. *Literary Digest* 79:68-69. *New York Daily Tribune*, March 12, 1873. *Ibid.* March 27, 1873. *Ibid.* July 9, 1873. *Ibid.* July 10, 1873. *New York Times*, March 27, 1873. *Ibid.* April 23, 1873. *Ibid.* May 22, 1873. FRANK R. LILLIE: The Woods Hole Marine Biological Laboratory. University of Chicago Press, pp. 15-23, 1944. *Sci. Mon.* 62:315-21.

The Location of Biological Stations: — The uniqueness of biological field stations lies in their location, in the opportunities they offer students and investigators to study biological forms at close range in their natural environment. While political, geographical, and other considerations enter into the establishment of biological stations, these institutions are usually located on sites near or within a unique biological environment, or else in an area where an abundance and variety of biological forms are easily accessible. Some believe the ideal to be an itinerant station or a "floating station," which provides more freedom to move to new sites frequently or periodically. Similar results in extending the working radius of a station have been obtained by establishing annexes or by removing a whole station to a new site after a period of years.

Ecological Location. — About one-half of the stations of the world are marine biological stations. The remaining ones are about evenly divided between being primarily situated for work in fresh-water biology and in terrestrial biology. While biological stations have penetrated the arctic (*e.g.*, Greenland), the desert (*e.g.*, Morocco), and the jungle (*e.g.*, Panama), there are many biological areas in the world possessing none of these institutions. Professor T. W. VAUGHAN has pointed out the "paucity of oceanographic stations south of the equator". Some of the larger areas without biological stations include Lake Victoria, the Caspian Sea, the Himalaya Mountains, the Andes Mountains, the tropical forests of Africa and South America, the prairies of Patagonia, the steppes of Tibet, and the deserts of Mongolia.

Political Location. — The estimated 265 biological stations in operation in 1940 were distributed in fifty-eight political divisions. The United States led in the number of existing field stations with sixty-three. Other

countries with a relatively large number of biological stations include the U. S. S. R. with twenty-three, France with twenty, Germany with fourteen, Japan with twelve, and Italy with ten. There are also a number of countries which, in 1940, had no biological stations within their borders. These include Turkey, Greece, Ethiopia, Iceland, and New Guinea.

There is little or no correlation between the population or size of a country and the number of biological stations it supports. Switzerland, for example, has one field station for about every 2,600 square miles of its territory, while Brazil has but one station for every 1,000,000 square miles of its land. For the political areas which have field stations, the mean figure is one station for about every 28,000 square miles. The number of inhabitants theoretically supporting a biological station also varies greatly. Every 400,000 persons in the Mountain States of the United States support a biological station in that territory. In China, on the other hand, there is only one station for every 140,000,000 inhabitants. The mean figure (for those areas having these institutions) is one station for about every 3,000,000 persons.

The greater the number of biological stations a country supports, the greater theoretical support that nation gives to biology. Such might be true if biological stations were of the same size and had approximately the same scientific output. When, however, the actual factor of size or output is considered, a country like Hungary with only one biological station is perhaps supporting more field biological research and instruction than Czechoslovakia with six of these institutions. Traditionally, some countries have followed a conscious or unconscious policy of dissipating their resources by establishing a number of small stations rather than fewer big ones. Professor HENRI LACAZE-DUTHIERS warned in the last century, "we have been able to count as many as seventeen or eighteen stations on our coasts [France] in the course of 1891. . . Is this not also an exaggeration and a dissipation of precious energies which, if concentrated into a single strong organization, might render very great service?"¹²

References — (1) *International Aspects of Oceanography*. Washington. National Academy of Sciences 1937. — (2) *Arch. Zool.* 2(9):255-363, 1891.

The Administration of Biological Stations:— Biological stations are sponsored by several types of organizations and institutions. They are organized usually as separate administrative units of the institution or organization which sponsor them. A director is generally appointed by the sponsoring committee to manage the work of the station. While the director's duties are concerned primarily with all the problems attendant to translating into action the educational and scientific philosophy of the institution, the two administrative problems with which most station directors are especially occupied are balancing the station's budget and giving the station the kind of publicity which will make the desired number of students and investigators attend the institution each session.

Sponsorship.— Biological stations usually have not sufficient financial strength to be autonomous institutions. Although separate administrative units, they are sponsored by various types of organizations and individuals. Universities and colleges appear to be the most frequent sponsors of con-

temporary biological stations. More than one-half of the stations in the United States are so supported. Scientific institutions and organizations less frequently play the role of sponsors of biological stations (*e.g.*, The Royal Society of Göteborg supports the Oceanographic Institute of Göteborg, Sweden). Governmental departments are also the sponsors of biological stations (*e.g.*, the Egyptian Ministry of Commerce and Industry supports the Fouad I Institute of Hydrobiology and Fisheries at Alexandria). In some cases, several types of organizations combine to support a biological station (*e.g.*, The Laboratory of Zoology of the University of Iași and the Ministry of National Education together sponsor the Marine Zoological Station "King Ferdinand I" at Agigea, Roumania). A few of these institutions are sponsored by private individuals (*e.g.*, Dr. FRIEDRICH MORTON is the sole supporter of the Botanical Station at Hallstatt, Austria). Lastly, about one-tenth of the biological stations are autonomous, being sponsored by an organization formed specially for that purpose (*e.g.*, The Bermuda Biological Station for Research is an institution founded and incorporated for the sole purpose of supporting its own scientific work)¹.

Organization. — Most biological stations are organized as more or less autonomous departments of the organizations or institutions which sponsor them. The parent institution usually appoints a kind of executive committee which in turn appoints a director in whom is vested most of the administrative duties. Those stations which are truly autonomous institutions often present the greatest administrative problems because they have no sponsoring institutions after which to pattern their organization and with which to integrate their functions. They often find it best to have a formal board of trustees. The executive committees or boards of trustees of the larger stations issue annual reports of the work of the institution. While most often they are summaries of research (*e.g.*, Report of the Reelfoot Lake Biological Station), occasionally they are administrative summaries (*e.g.*, Report of the Marine Biological Laboratory, Woods Hole, Mass.)

Directors. — The bulk of the administrative work of most biological stations falls upon the directors of these institutions. They are usually appointed to these positions by the executive committee or the board of trustees. Not infrequently in the case of younger stations, the directors have assumed their positions by being the founders of the institution (*e.g.*, ANTON DOHRN, founder and first director of the Zoological Station of Naples). About one-quarter of the directorships are full-time positions. Most of the stations, however, are in operation only a portion of the calendar year and consequently these positions are part-time ones. During the greater part of the academic year, the directors are usually university or college professors, although their vocations vary from that of a superintendent of schools to a drug store proprietor. In any case, the directors are scientists, most often, zoologists.

Finances. — The financial problems facing the directors of biological stations are those facing most other institutions: how to obtain an adequate income and how to spend it wisely. Biological stations obtain the largest share of their income from the services they render in providing facilities for research and instruction to investigators and students. Even so, most

of these institutions are unable to meet their expenses through tuition and laboratory fees and must turn to supplementary sources of income. These include income from their sponsoring organizations (in the form of direct subsidies), from the government (for scientific services), and from the public (for admission to aquariums). Autonomous institutions must seek even a wider source of income which often include outright government grants, endowments, the sale of biological specimens, and membership and patron fees. Once acquired, the income of biological stations is expended on administration, instruction, research, and the maintenance and operation of laboratory and living facilities.

The actual budgets of biological stations vary with their purpose, size, and age. The Marine Biological Laboratory has had the largest budget: \$185,096 in 1938. Several of these institutions, on the other hand, have annual budgets of less than one thousand American dollars (*e.g.*, Biologic¹ Laboratory of Lake Orédon, France, has an annual budget of 4,000 francs or \$106). Any attempt at obtaining an average budget is meaningless because of the varying currencies, standards of living, and even accounting practices. It is worth noting, perhaps, that England has an average yearly budget of \$28,470 per station, whereas Italy has an average annual budget of \$421 per station (excluding the international Zoological Station of Naples). The average annual budget of one-half of the existing United States stations is \$21,130.

Publicity. — Since the financial success of most biological stations is very much dependent upon the attendance of a full quota of students and/or investigators, various publicity practices have been devised to attract these students and investigators. In the United States, it has been the custom for most of these institutions to issue annual announcements of their available facilities. About three-quarters of the United States stations publish such announcements. They may vary from a one-page mimeographed sheet (*e.g.*, the 1940 announcement of the San Francisco State College Science Field Session) to a 35-page booklet (*i.e.*, 1940 announcement of the Marine Biological Laboratory). The stations in the United States which do not issue annual announcements are either in the early stages of existence or offer only research facilities, in which case a detailed printed announcement may serve for several years. Several of the American stations supplement the publicity given in their annual announcements by inserting news notices in the unpaid columns of certain scientific journals (*e.g.*, *Science*) or paid advertisements in others (*e.g.*, *Nature Magazine*). In Europe, station announcements more often take the form of one-page brochures, printed annually and describing the current offerings in instruction or research. These are often supplemented by printed rules and regulations which are issued irregularly.

Directors of biological stations often obtain general publicity for their institutions by cooperating in the production of general articles about the work of the station in popular publications (*e.g.*, *Machete Trails* by DALLAS L. SHARP in *The Atlantic Monthly* in 1930). They also coöperate in the compilation of directories of the biological stations of a political or geographical area (*e.g.*, the 1937 issue of *The Biologist* [Phi Sigma Society] devoted to Biological Summer Schools). The most effective kind of publicity for

the biological stations of all countries results from the unqualified satisfaction and enthusiasm of students and investigators who have attended these institutions. Some stations have attempted to sustain this enthusiasm by organizing loosely-formed alumni associations with irregular meetings and newsletters.

Note: — (1) LILLIE shows the advantage of autonomous organization in "freedom from all restrictions of local institutional control." Cf. FRANK R. LILLIE: *The Woods Hole Marine Biological Laboratory*. University of Chicago Press, p. iii, 1944.

The Equipment of Biological Stations:—The kind of equipment with which a biological station is able to carry out its program depends upon its purposes and its resources, to a lesser extent upon its ecological and political location. Most biological stations have some sort of campus on which are constructed one or more buildings. These are equipped with laboratories and scientific apparatus for instruction and research. In addition, these institutions are also equipped to furnish board and lodging for those in attendance. There are a few itinerant stations which often have the same problems and needs of the stationary institutions and therefore have much of the same equipment, except a permanent campus and buildings.

Buildings.—In planning the laboratory buildings for the Anderson School of Natural History, LOUIS AGASSIZ stated, "I was determined that we should not be satisfied with that mode of proceeding of which we have so many examples in these medieval castles for the abode of modern science. I wanted, if possible, that our rooms should correspond at once with our work"¹. While most directors have perhaps had this philosophy of planning, they usually have not had the financial opportunity to put such architectural theories into practice in establishing or even subsequently enlarging these institutions. Several stations have started and often continued in buildings erected for other purposes: the Murman Biological Station in a monastery, the Oregon Institute of Marine Biology in an abandoned Civilian Conservation Corps camp, the Zoological Station at Villefranche in an abandoned coaling station, the Hydrobiological Section of the Scientific Institute of Peterhof in an appropriated country estate, and the Laboratory of the Fresh-water Biological Association at Ambleside, England, in veritably a medieval-looking castle.

The size of biological stations is not usually proportionate to the number of buildings, but rather to what they contain. Thus the Zoological Station of Naples is housed in one building whereas the smaller Allegany School of Natural History maintained forty-seven building units. In general, biological stations can be classified into small, medium, and large plants. The smallest number of stations have relatively large plants. The ten top-ranking institutions in regard to the size of their physical plants probably would include, though not necessarily in the order given, those stations at Woods Hole (Marine Biological Laboratory), Naples, Plymouth, Helgoland, Woods Hole (Woods Hole Oceanographic Institution), La Jolla, Friday Harbor (and Seattle), Monaco, Roscoff, and Cold Spring Harbor. All except the last-named institution happen to be chiefly equipped for marine research. The largest inland biological stations would probably include those at Douglas Lake, Michigan; Put-in-Bay, Ohio; Lunz, Austria; and Jungfrau-joch, Switzerland.

Laboratories and Apparatus. — Whatever their size, biological stations contain various types of laboratories and rooms equipped with apparatus with which to carry on their different functions. Increasingly this apparatus has become more complicated than the original equipment of the early field stations. Today even small stations are supplied with fairly intricate apparatus which never enters the field in the sense that it never leaves the laboratory.

The laboratories and apparatus of biological stations serve primarily for general research and instruction. In addition, a number of these institutions are also equipped for research in special fields, for photography, for collecting, for repairing, and for distributing supplies. The other functions for which many biological stations are equipped include public education, miscellaneous services, and library work.

Apparatus for General Biological Research. — Most field stations, even if they have no laboratories equipped for special functions, do have at least one room equipped for general biological research. Such equipment includes laboratory furniture, common chemicals and glassware, running fresh-water (and often sea-water), small aquariums or terrariums, electricity, and occasionally gas, compressed air, and vacuum pipes.

Those stations which have piped sea-water usually take precautions to insure the purity of the water, both at its source and during its conduct through pipes to the desk of the student or investigator. As Professor KORÖID observed, "much may be done by sedimentation and by preliminary storage in the dark to improve polluted waters for circulation in aquaria and laboratories; but, after all is said, purity of water supply is the greatest asset of the marine station"². At least one station (*i.e.*, Bergen Museums Biological Station) has had to change its site because of the contamination of the waters adjacent to its original location. Another institution (*i.e.*, Oceanographic Institute of Göteborg, Sweden), desiring a certain type of sea-water, obtains it by freighter from the Bay of Biscay.

Apparatus for Instruction. — The nature of the instruction offered at biological stations is usually such to necessitate only the minimum of instructional apparatus. For those courses demanding inside laboratory work, class rooms and laboratories have to be provided. These often contain the apparatus furnished to the general research laboratories. In addition, they are often equipped with blackboards, charts, and microscopes. A few stations have special lecture rooms, although at most of these institutions, the lectures — if any — are of an informal nature, being often given in the laboratory or during a field trip.

Apparatus for Special Services. — Laboratory apparatus is often supplied for research in various special fields of science. While these fields vacillate with the trends in biology, the more common ones are bio-chemistry, physiology, and taxonomy. Other subjects for which one or more biological stations are especially equipped include bio-physics, economic fisheries, hydrography, bacteriology, and microscopy.

Photography is an important aid to field instruction and research. Most biological stations are equipped with rooms to develop and print photographic negatives. While most stations usually have only one darkroom,

the larger institutions often have several which are well-equipped with developing and printing apparatus.

Since the collection of scientific specimens has increasingly become an art, complicated equipment and even highly-trained personnel are needed. Many stations maintain boats and automobiles for collecting purposes. The boats vary greatly in number and size. Some stations use and need only rowboats and canoes. Others have large vessels, such as the 112-foot *Makrele* of the Biological Station of Helgoland. A few boats have been specially-built for scientific work, such as *The Atlantis*³ of the Woods Hole Oceanographic Institution⁴. Stations which do have boats must have places to keep them and often employees to run them. In addition to operating boats, the stations which do a large amount of collecting must have employees who, if not formally-trained scientists, must know enough practical biology to be able to go out in the station's vessel and find the various biological forms that are wanted. One of the most famous of such collectors was SALVATORE LO BIANCO who for many years was conservator of the Zoological Station of Naples.

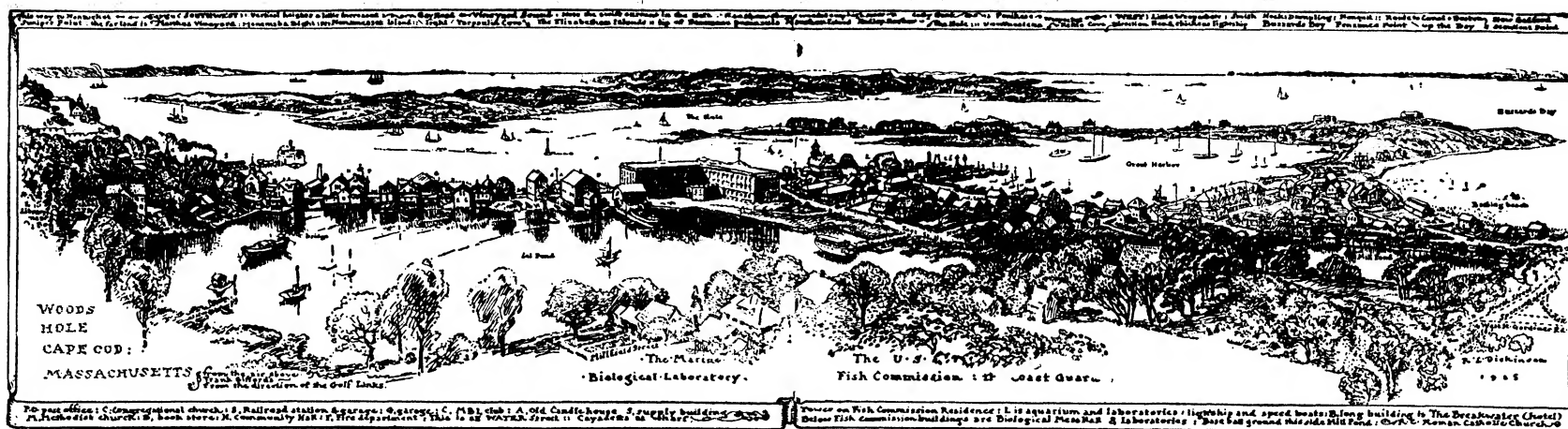
As scientific apparatus is used at biological stations — as elsewhere — it needs adjustment, becomes broken, or wears out. At institutions situated in isolated places or at the larger ones, it is often expedient for the station itself to attempt to adjust, repair, or make research apparatus. To meet these needs, several stations have well-equipped shops for machine-work, carpentry, and glass-blowing.

Most stations have had to be equipped for the distribution of scientific apparatus and supplies to those in attendance. Equipment for this purpose at the larger institutions includes stock rooms, station stores, and, in several instances, whole departments for the sale of live and preserved biological forms.

Apparatus for Public Education. — The public education attempted by biological stations is usually by means of aquariums, museums, and botanical gardens. The more ambitious of each of these projects demands elaborate equipment and personnel. The aquariums vary in size from small, one-room exhibits in table tanks to very large installations as at the stations at Naples, Helgoland, and Monaco. Public museums also are often operated in conjunction with the marine aquariums (*e.g.*, Monaco). Botanical gardens are maintained by several stations. While they do not entail much equipment, they usually require the services of several gardeners and laborers to give them the constant care required for their successful operation.

Apparatus for Miscellaneous Services. — One of the auxiliary functions of field stations is the securing of regular hydrographic and meteorological observations, often in coöperation with other agencies (*e.g.*, the Weather Bureau and the Coast Guard in the United States). The equipment necessary to take these observations varies from simple thermometers and rain gauges to tidal stations and apparatus for measuring direct and diffuse solar radiation (*e.g.*, Oceanographic Laboratories of the University of Washington).

Other functions for which many biological stations must be equipped are administration and transportation. While much of the administrative work in connection with the conduct of biological stations is often carried



A VIEW OF THE LABORATORIES AT WOODS HOLE, CAPE COD, MASSACHUSETTS (ca. 1925), after an etching by R. L. Dickinson.

on at the offices of the sponsoring institutions, many need some kind of office and secretarial aid in the field. Likewise, while individuals often provide their own transportation to biological stations, these institutions must often provide transportation for classes and supplies. This is done by means of various types of boats and automobiles. While most stations in the United States have one or more automobiles, only a few institutions in Europe or elsewhere have such vehicles.

Library Facilities. — Most biological stations have some kind of library. The type varies with the purposes of the institution and the actual use to which the library is put. Some of the smaller institutions have a very small, yet adequate, collection of taxonomic manuals and reprints. Other stations have rather complete libraries on special subjects (e.g., the bryological library of the Summer School of Bryology). A few stations have large libraries with bound volumes, reference books, reprints, and current serial publications on a number of biological subjects. Such collections require much equipment and the services of full-time librarians. The largest library operated by any biological station is that of the Marine Biological Laboratory. It ranks as one of the best libraries of scientific serial publications in the world.⁵

Itinerant Stations. — While not possessing fixed campuses or buildings, itinerant institutions nevertheless require the other necessary equipment for biological stations. Certain peculiar equipment of itinerant institutions include boats for the aquatic ones (e.g., the ill-fated *Pourquoi Pas?*) and trucks, automobile caravans, and buses for the terrestrial ones (e.g., Animal Ecology Field Trip of the University of Illinois). Cumbersome libraries and heavy apparatus are usually not maintained by these stations, although otherwise they possess the regular equipment necessary to care for the laboratory and living needs of their students, investigators, and faculty members.

References and Notes: — (1) New York Daily Tribune, July 9, 1873. — (2) U. S. Bur. Educ. Bull. 1910 (4):1-360, 1910. — (3) cf. annual announcement of this institution for a detailed description of this vessel. — (4) Other vessels over 100 feet in length attached to biological stations include *De Lanessan* (Cauda, French Indo-China), *Mabahiss* (Alexandria, Egypt), *Africana* (Sea Point, Union of South Africa), *E. W. Scripps* (La Jolla, California). — (5) It contains 6,000 bound volumes, 52,000 bound serial publications, 1,300 current serial publications, and 130,000 reprints. Cf. FRANK R. LILLIE: The Woods Hole Marine Biological Laboratory. University of Chicago Press, pp. 100-05, 1944.

The Living Facilities at Biological Stations: — A majority of biological stations offer living facilities to their students, investigators, and staff members in addition to opportunities for research and instruction. Some of the early field stations did not concern themselves with the board and lodging needs of those in attendance, often because these were available in nearby towns. The Zoological Station of Naples, for example, has never made an attempt to provide living facilities, other than a noonday meal. As these institutions, however, began to be established in environments removed from centers of population, their managements were forced to provide living accommodations. From the inclusion of these facilities at some stations because of sheer necessity arose their inclusion at others because of saving both time and money of the students attending them. Also the value of maintaining living facilities was recognized as making for a closely-integrated scientific community¹. For a physiologist to live in the same dormitory as a taxonomist was liberalizing. Equally broadening was the student's being able to eat at the same table with the faculty member.

From providing board and lodging, some stations soon extended their offerings to medical service and organized recreation. Today, therefore, a great many biological stations are prepared to offer those in attendance much more than a laboratory desk and a rowboat. That these facilities exist and often entail great administrative problems and expenses do not detract from the purpose of biological stations. Indeed, living facilities are furnished so that a student or investigator may better be able to fulfill the

purpose of the institution, may better be able to use that laboratory desk and rowboat.

Board. — Somewhat less than one-half of the field stations of the world offer boarding accommodations to those in attendance. This proportion often varies with the political area in which the station is located. Countries which have a high proportion of their stations offering dining accommodations include Japan, Canada, and the United States. Those countries which have a low proportion of their field stations offering boarding accommodations include Italy, Germany, France, and Sweden.

The equipment which these institutions require to prepare and serve meals varies both with the resources and needs of the stations and occasionally with the customs of the country in which they are located. The larger stations in the United States have separate dining buildings with mechanically-equipped kitchens. The itinerant field stations, on the other hand, have portable cooking apparatus. One of these stations (*i.e.*, West Virginia University Biological Expedition) has a kitchen on wheels.

The administration of the boarding facilities at these institutions is usually vested with the director of the station. In a few instances it is leased to a concessionaire or, in small European stations, relegated to the *concierge* who is paid directly by the student or investigator. At several American stations board is offered on a coöperative basis: the students, investigators, and faculty members who receive board determine the policies of the commissary department.

Several biological stations offer equipment for students and investigators to prepare their own meals. In some instances, the students are expected to coöperate in preparing the meals. At other stations the students or investigators are expected to buy their own food and prepare it separately. The Marine Biological Station of Fouad I University in Egypt is unique in that the investigator shares in the services of a cook and houseboy (*farrash*), although he is expected to buy the unprepared food at a nearby canteen.

The biological stations which do not provide board or facilities for individuals to prepare their own are usually located within walking distance of places where meals can be obtained. Indeed, several American stations have established their headquarters in hotels where students are expected to obtain board.

Lodging. — About two-thirds of the biological stations of the world offer lodging accommodations. Almost all of the institutions which offer boarding facilities also offer lodging. In addition, one-fifth of the stations of the world which are not equipped to serve meals are equipped with sleeping arrangements. The countries which rank high in the proportion of field stations within their borders offering lodging facilities include Roumania, the Netherlands, Japan, Canada, United States, Sweden, and France. Those countries with a low proportion of their stations providing room include Algeria, Denmark, Italy, and Switzerland.

The equipment which these institutions require to lodge those in attendance varies both with the individual station and with the standard of living for the country in which it is located. In the United States, lodging accommodations range from the large dormitories of the Marine Biological Labo-

ratory with running hot and cold water in many rooms to the few supplies needed for the students to spend the nights in a sleeping bag at the Pacific Union College Field Nature School. Many of the stations in the United States maintain attractive cabins or sometimes tents for two or three persons each. In Europe, the lodging accommodations at most field stations are in the same buildings as the laboratory work, although at several stations (*e.g.*, Zoological Station of the Netherlands Zoological Society) special structures for lodging have been erected.

The maximum number of persons who can obtain lodging accommodations at a station ranges from 275 at the Marine Biological Laboratory to less than five (*e.g.*, Biological Station of Wijster). The biological stations which are prepared to care for the lodging needs of a large number of students and investigators include, in addition to the Marine Biological Laboratory, the Biological Station of the University of Michigan (with accommodations for 200 persons) and the Lake Itasca Forestry and Biological Station (with accommodations for 100).

The biological stations which do not provide lodging are usually located near places where it may be obtained. The Lake Geneva School of Natural Science, for example, is located on the grounds of College Camp, an enterprise which furnishes lodging and board. The Oceanographic Museum and Aquarium at Monaco, although offering no lodging facilities, is located near a number of *pensions* and hotels where the investigator may obtain rooms within a wide price range.

Cost of Living Accommodations. — The biological stations which offer both board and lodging usually charge one sum for both of these services. This amount varies for stations within a given country and for those in different countries. The highest cost is \$28.00 a week for room and board (*i.e.*, Barro Colorado Island Biological Laboratory) and the lowest cost is the equivalent of \$1.34 a week at the Marine Biological Station of the Tōhōku Imperial University in Japan. The average cost per week for board and lodging at fifty-eight stations is \$9.00.

Those field stations which charge relatively high prices for board and lodging usually are, 1, in remote areas where food acceptable to foreigners is relatively costly (*e.g.*, \$28.00 a week at the Barro Colorado Island Biological Laboratory in Panama); 2, in countries where the cost of living is normally high (*e.g.*, \$15.21 a week at the Bermuda Biological Station for Research, Inc.); or 3, in countries with an unfavorable rate of exchange with the American dollar or British pound (*e.g.*, \$16.85 a week at the Biological Station of Helgoland). In the United States, the reasons for the high costs of board and lodging at some stations are either their location in relatively remote areas (*e.g.*, \$14.00 a week at the Science Summer Camp of the University of Wyoming) or their location in parts of the country where living costs are usually high (*e.g.*, \$10.50 a week at the Biological Laboratory of the Long Island Biological Association).

Health and Recreation. — Community hygiene is only considered a factor of importance at those biological stations which have a large number of students and investigators in attendance. Most of the institutions outside the United States have shown no special regard for the health of their students or investigators, except in the case of tropical countries where this

is more essential. The greatest care for the health of students and investigators at any of these institutions has been taken at the Biological Station of the University of Michigan. Here a physician is in residence to provide medical service if the need should arise. He also supervises general camp sanitation. A one-room hospital is also available at this station for any person who may need temporary medical detention.

Many of the biological stations in the United States and a few of those in other parts of the world provide organized recreational facilities for persons in attendance. In most cases the recreation is in charge of the director, often assisted by staff members and students. Excursions, picnics, campfires, and dances are some of the recreational activities offered. One of the results of the organized recreational activities at biological stations has been the growth of a series of songs, either about life at the station or about the biological forms studied.

Another result of the announced recreational activities at biological stations (together with their location) is that some students, especially in the United States, attend these institutions as much for a vacation as for the instruction they will obtain. While the recreational activities at some stations do attract vacationists, those institutions which are sensitive to the recreational needs of students and investigators do not have the frequent problem of a general exodus of students from the station to a nearby town each week-end in search of amusement.

Note: — (1) An appreciation of the contribution of community life to the scientific program of the Marine Biological Laboratory is given by E. G. CONKLIN and FRANK R. LILLIE in the latter's *The Woods Hole Marine Biological Laboratory*. University of Chicago Press, pp. 170-76, 1944.

Instruction at Biological Stations: — One of the primary purposes for the operation of biological stations is the field instruction they offer. More than one-half of the contemporary field stations offer some kind of formal instruction in the biological sciences and related subjects to beginning and advanced students. A number of these institutions also conceive within the scope of their activity various kinds of public education, such as the maintenance of public aquariums and museums.

Those field stations which offer formal instruction are of two types: the so-called typical biological station which is equipped to offer both instruction and research, and the biological nature camp which is devoted almost wholly to instruction. In giving instruction, both kinds of institutions must solve certain problems attendant to the course work, in addition to those of equipment and living facilities. They must secure an adequate staff of instructors. They must evolve an educational philosophy to decide the course work to be given and the organization of the actual teaching. They must decide on the actual courses to be offered. They must solve a series of administrative problems related to curriculum practices, academic credit, tuition, and scholarships. Lastly, they must occasionally analyze the students they attract in order to compare the product of instruction with the aims of instruction.

The Teaching Faculty. — About 350 persons are engaged in teaching activities at the various biological stations each year. While some of these institutions have only one faculty member (*e.g.*, Summer School of Bry-

ology), the Marine Biological Laboratory has twenty-six. The average number of faculty members for those stations which do have formal instruction is between three and four.

Education, Academic Position, and Specialization.— Three out of four faculty members of biological stations in continental United States have their doctor's degree, and this figure is higher for those faculty members at the field stations of most other countries. A few stations have no faculty members with doctorates (*e.g.*, Lake Enemy Swim Biological Station), while the entire faculty of several of the larger field stations do have their doctor's degrees (*e.g.*, Scripps Institution of Oceanography).

The majority of faculty members are university professors, although their occupations during the period of the year in which the station is not in session vary from that of a retired high school teacher (*i.e.*, Dr. A. J. GROUT of the Summer School of Bryology) to a United States National Park Naturalist (*i.e.*, C. A. HARWELL of the Yosemite School of Field Natural History).

The majority of the faculty members of biological stations are zoologists. Among the fields of specialization other than general zoology, botany, and biology of the faculty members may be included oceanography, nature education, geology, meteorology, and astronomy.

Institutional Inbreeding and Faculty Turn-over.— During the regular academic year a large proportion of the faculty at biological stations is attached to the institution which sponsors the station. This is a type of institutional inbreeding. In the United States, this practice varies from one hundred per cent (*i.e.*, Oceanographic Laboratories of the University of Washington) to none, especially in those field stations which are autonomous and therefore do not have parent institutions. While it is often easier for a field station to employ faculty members attached to its sponsoring institution, a more qualified staff can often be obtained at least partially from outside institutions.

In order to prevent complete inbreeding of their faculty, several of the biological stations of the United States make a practice of employing instructors from outside institutions for one or several seasons. One station with eleven faculty positions has had seven of these filled by different persons in a space of four years. Another station (*i.e.*, Michigan State College School of Field Biology) with a faculty of three, has not had a change in its staff for a period of eleven years.

A frequent change of faculty members does not usually increase the quality of instruction, even though it may bring in a new point of view for a time. Some of the best instruction at these institutions is given by those persons who have taught at one station for many years, since most field instruction demands as much knowledge of the particular environment around the station as of the subject-matter itself. Yet while a slow faculty turn-over is a definite asset to the quality of instruction at many of these institutions, continuous teaching at any one station might retard the scientific progress of a particular instructor. This whole problem of faculty turn-over is one which few stations have answered successfully. One method of solving this problem has been the granting of a periodic leave of absence to

the instructor and then keeping his position on the staff unfilled for the period he is absent from the station.

Teaching Load.— It is not easy to calculate the average teaching load of faculty members while in residence at biological stations because the teaching load is a function of the instructor's philosophy and method as well as of the actual number of students, courses, or credits for which he is held responsible. Of forty-nine United States stations, each faculty member in general is responsible for about seventeen students, although this varies from almost six students for each faculty member of the Marine Biological Laboratory to a theoretical number of sixty students for the one faculty member of the Laguna Beach Marine Laboratory.

The average number of courses each faculty member teaches is often a better criterion of teaching load than the average number of students, because course enrollments differ as widely within field stations as within colleges or universities. At the typical field station the instructor is responsible for teaching one course which, in the United States, averages between four and five academic credit hours of work. This figure varies from one-fifth of a course for each instructor (*i.e.*, New Hampshire Nature Camp) to three courses for the instructor (*i.e.*, Merricomm Biological Laboratory).

The average teaching load of most faculty members at field stations is such that they spend more than one-half of their time in teaching. The remainder of their time is spent in their own research or in supervising the investigations of advanced students. Most of the faculty members of American stations bring their wives and children with them to live at the station and they spend, therefore, a portion of their time with their families.

Educational Philosophy.— Once a biological field station has decided to offer formal instruction, it must next evolve an educational philosophy to determine the type of course work that it will give. Field stations have, in general, followed one of two educational philosophies, although the majority of stations offering formal instruction combine the two concepts as much as they are able.

One type of station has adhered to an educational philosophy of offering only advanced instruction, especially for persons preparing to receive advanced degrees or to become research investigators. While the Marine Biological Laboratory is perhaps the outstanding example of such an institution, at least twenty-five other stations adhere to this policy.

The opposite practice is that held by the biological stations which believe that field instruction should be of an elementary nature. This type of station, of which almost all are in the United States, offers only elementary courses for public school teachers and undergraduate students who have neither the desire nor the training for extreme specialization.

That both philosophies of instruction at biological stations have a legitimate appeal may be seen from the fact that more than one-half of the biological stations of the world which do offer instruction are prepared to give courses both to elementary and to advanced students. And in actual practice, the instruction at biological stations is not only determined by their educational philosophy, but also by their location, the instructors available, and the potential student-body.

Advanced Instruction. — The biological stations which offer only advanced course work are located from Finland to Algeria, from Maine to the southern part of California. The actual course-work offered by these institutions is often of a very advanced nature (*e.g.*, advanced invertebrate embryology at the Oceanographic Laboratories of the University of Washington), although several are intermediate courses and may be taken with only one previous course in the biological sciences (*e.g.*, entomology at the University of Michigan Biological Station). The biological stations which offer only advanced instruction may often be distinguished more by their admission requirements than by the courses they offer. Graduate and occasionally upper-class undergraduate students are admitted to these institutions. Yet even students of these ranks may take certain courses only after fulfilling certain prerequisites.

Elementary Instruction. — At least eighteen biological stations offer only elementary instruction. These institutions are, with the exception of the Helgoland Bird Observatory, located in the United States. The courses given at these institutions are usually in the fields of nature study and the pedagogical training of nature-study teachers. The requirements for admission to these institutions are minimal, for the purpose of instruction is generally to engender an appreciation and understanding of the outdoors by means of field trips and observations. Several institutions in this category are particularly interested in training special groups of persons, as teachers in nature study (*i.e.*, West Coast School of Nature Study) and leaders of nature recreation (*i.e.*, Virginia Natural History Institute Nature Leaders' Training Course).

Combined Instruction. — A majority of the biological stations which consider at least a portion of their function to be instruction offer course work to both advanced and elementary students. These institutions believe that both the beginning and advanced student may receive inspiration and instruction by being at the same biological station, if not actually attending the same courses. The actual courses at these stations vary from those of a very elementary nature (*e.g.*, man and the living world at the Isles of Shoals Marine Zoological Laboratory) to advanced ones with many hours of prerequisites (*e.g.*, parasitology at the Lake Itasca Forestry and Biological Station).

The requirements for admission to these biological stations which offer both elementary and advanced instruction are relatively flexible. In general, the requirements depend more upon the actual courses to be taken by the student, than by his general academic rank. Some of these stations (*e.g.*, Allegany School of Natural History) are open to "gifted high school students" and others (*e.g.*, Lake Itasca Forestry and Biological Station) are "open to all qualified graduate students who have had the usual preliminary courses in biological subjects." The purpose of the instruction given by institutions in this category also varies from fulfilling part of the science requirements of "pre-professional students, such as pre-medical, pre-dental" (*i.e.*, Isles of Shoals Marine Zoological Laboratory) to assisting "persons interested in the study, collection and determination of particular groups of animals and plants" (*i.e.*, Oregon Institute of Marine Biology).

The Courses. — About two hundred and fifty courses are given by those biological stations which offer some kind of formal instruction. Each institution offers an average of three courses a year, although the majority of stations give only one course. The American stations tend to offer more courses than those in other countries. One American station (*i.e.*, Lake Itasca Forestry and Biological Station), offers eighteen courses, while the largest number of courses given by a station located outside the United States is six (*i.e.*, Marine Biological Station of the Tōhōku Imperial University). Those stations offering only elementary instruction tend to give the fewest number of courses, while those which give only advanced instruction offer the greatest number of courses, perhaps because of the specialized needs and interests of advanced students.

Sciences Represented. — Most of the courses offered by biological stations are naturally in the biological sciences. While the largest number of courses are offered in zoology, the proportion varies from almost less than one-half for the stations in the United States to less than one-fifth for those institutions in other parts of the world. The inclusion of courses not within the traditional limits of zoology, botany, or biology indicates that these institutions fully realize the need of exploring, by instruction as well as research, the borderline fields between biology and the social sciences (*e.g.*, nature education) and biology and the physical sciences (*e.g.*, marine meteorology). Another need felt and realized at several stations is the integration of both the physical and biological sciences into one field course at an elementary level (*e.g.*, nature study).

A classified list of the general fields in which course-work is offered at one or more biological stations follows: protozoology, invertebrate zoology, helminthology, entomology, ichthyology, ornithology, vertebrate zoology, field zoology, animal ecology, economic zoology, parasitology, embryology, comparative anatomy, algology, mycology, bryology, taxonomy of higher plants, field botany, dendrology, plant ecology, plant physiology, plant anatomy, plant morphology, plant histology, limnology, marine biology, general ecology, general physiology, microbiology, wild life conservation, biochemistry, paleobiology, oceanography, nature study, nature education, geology, meteorology, chemistry, seismology, astronomy, and geography.

Types of Courses. — Instruction at biological stations probably first arose when college and university professors realized they could not teach successfully about marine life a hundred or thousand miles away from the sea. Instruction was first given at biological stations in subjects which could not be thoroughly or scientifically taught (*i.e.*, by observation and/or experimentation) in the ordinary college or university campus laboratory located often miles from a forest and even further from fairly uncontaminated seashore. Thus the first subjects to be taught at field stations were 1, the taxonomy of biological forms, for the whole kingdom (*e.g.*, plant taxonomy), for a special area (*e.g.*, botany of the Alps), or for a special group (*e.g.*, bryology); and 2, the ecology of biological forms, either for a whole kingdom (*e.g.*, animal ecology), or for special environments (*e.g.*, limnology).

As the research programs of biological stations became increasingly concerned with physiological problems, courses in physiology were given

at these institutions. At first these courses made good use of the living organisms in the field station environment. This departure, however, from the traditional type of course-work at field stations perhaps helped to lead to the initiation of a whole series of courses offered by these institutions which had less and less relation to the environment in which they were located. Courses such as cell morphology, experimental surgery, and histology-embryology appear in the catalogues of contemporary stations. Today students often go long distances to attend a field station which offers a course in a subject which may perhaps be better taught at a well-equipped university campus in the center of a large city.

There are several reasons for the introduction of these so-called "laboratory" courses at field stations. Some laboratory and lecture courses have been given frankly to attract a sufficient number of students to make the continuance of the station and especially of its field program possible. Such courses, for example, have often been for pre-medical students, the latter actually subsidizing the courses offered by the institution in the less popular "field" subjects. A second reason for the introduction of courses often unrelated to the station's biological environment is found in the station's research program. Several stations are avowedly more concerned with research than with instruction. The teaching they do offer is quite secondary and dependent upon both the station's research program and the staff members available as instructors. Thus the Biological Laboratory of the Long Island Biological Association offers a course in experimental endocrinology because it is one of the spheres of research upon which the laboratory has decided to concentrate; also, a member of this station's staff is perhaps more qualified to teach this subject than one more related to the environment in which the station is located. Other reasons for the offering of laboratory courses at field stations, in the words of station officials, are "we can get better work out of the student" and "there is a need for these courses and they are given nowhere else."

Another trend is the use, at some stations, of indoor laboratory methods even in field courses which may best perhaps be taught with so-called outdoor methods. Dr. CHARLES C. ADAMS once commented, "I have known of cases where the *field* school merely repeated the city class work, only using fresher material than in the city, and without the slightest idea that this was not a sane procedure". Such observations have caused some American biologists to believe that their students can often obtain better field instruction and experience from courses on several university campuses not too removed from "the field," than at some biological stations even in isolated places.

The Subject Matter.—While some courses offered by different biological stations may have the same titles, their subject matter often differs greatly. This divergence is most often due to the location of the station and to the training of the instructor, although the educational philosophy of both the station and instructor are important contributing factors. Because of their small classes, biological stations can be remarkably sensitive to the needs of their students. The courses given are often markedly altered once the instructor knows the wishes of the students actually registered in any course in a given year.

Administrative Problems. — The instruction at biological stations is most often organized into one, short session, beginning in June. Three-quarters of these institutions which give instruction offer it at only one session a year. Those stations which offer more than one session do so because of limited classroom facilities (*e.g.*, Zoological Station of the Netherlands Zoological Society), because of the desire to give instruction at different times of the year (*e.g.*, West Coast School of Nature Study), or in order to give instruction in different localities (*e.g.*, Oglebay Institute Nature Leaders Training School). The largest number of sessions is offered by the Audubon Nature Camp. This institution gives five two-week sessions each summer, the desire being to train a large number of students rather than to teach one-fifth the number five times as long.

The length of the sessions at biological stations ranges from one week to nine. Almost one-third of the sessions are two weeks in length, while about one-fifth are for a six-week period. The shortest sessions are usually conducted by nature camps, while the longest ones are at those stations offering only advanced instruction.

The time of the year when instruction is given at biological stations depends upon a number of factors, of which the flora and fauna, the students, and the faculty are most important. Instruction can only be given at those times of year when the desired animal and plant forms can be adequately studied in the field. Instruction in alpine botany, for example, can usually not begin before July in the Alps, whereas marine biology may best be studied along New England during August. The time of the year when students and faculty members are normally free from their regular college or university studies limits instruction at biological stations to the summer vacation in the northern hemisphere. The stations in France and England, however, have long made a practice of offering courses during the universities' Easter recess in April. This is a time which is fairly favorable for the study of marine biology in those countries in Europe and it is also during the student's term at the university — an advantage because the student can closely relate the field biology learned at the station to the laboratory biology studied at the university. The West Coast School of Nature Study is the only institution in the United States which has recently attempted to give a session during the Easter recess.

June and July is the period of the year during which the greatest number of sessions is given. October is the latest month in the year that a course is offered at any biological station (*i.e.*, at the height of the autumn bird migration season a course in ornithology is given at the Rossitten Bird Observatory).

Academic Credit. — In biology as well as in most other subjects, contemporary university students, especially in the United States, not only take courses for the knowledge they receive, but also for the credit they may obtain toward an academic degree. For this reason biological stations have found it expedient to offer college credit for formal course work completed by students at these institutions.

In the United States, about four-fifths of the biological stations offering instruction have made arrangements for students satisfactorily completing course work to obtain credit. Those field stations which are directly spon-

sored by colleges and universities have the privilege of granting credit because of their connection to these institutions of higher learning. Biological stations which are sponsored by institutions other than colleges or universities, or are only partially sponsored by them, often make arrangements whereby work done at them is recognized by some nearby or affiliated college or university and is thus transferable to other such institutions throughout the country. Some autonomous field stations use similar procedures to obtain credit for their students. Ten field stations in the United States do not offer academic credit. These range from institutions which offer instruction of a very advanced nature (*e.g.*, Marine Biological Laboratory) to those stations where the instruction is very elementary (*e.g.*, Green Mountain Nature Camp).

Tuition and Scholarships. — Students are assessed tuition fees at most biological stations. These fees are usually for instruction, and sometimes include scientific supplies and transportation on field trips. The average tuition at forty-six biological stations is the equivalent of \$28.82. Tuition costs range from \$1.00 at the Nature Enjoyment Camp to \$75.00 at the Marine Biological Laboratory. This variation is due to a number of factors, the most evident of which is the length of the session. A base for comparing the tuition is, therefore, that charged students per week. This ranges from \$.35 weekly at the Zoological Station of Tvärminne to \$14.25 weekly at Science of the Out-of-Doors. The average weekly tuition is \$5.73, the amount being \$4.57 for the ten stations outside the United States about which information on the cost of tuition is stated.

At least fourteen biological stations regularly charge no tuition fees. More than four-fifths of these are outside the United States. A number of stations in the United States, however, offer tuition scholarships for students who desire a diminution of fees either because of their scholastic excellence or financial distress. These scholarships are either offered directly by the administration of the station or by organizations interested in the work that the station is doing (*e.g.*, two partial scholarships for students at the Allegany School of Nature History have been provided by the Burroughs-Audubon Nature Club of Rochester, New York).

The Student Body. — Instruction is given at biological stations for the benefit of students who take the formal course work. The type of instruction offered is determined by the educational policy of the institution. At a number of the smaller stations, however, it has been expedient to determine this policy only after considering the desires of the potential and actual student body of the station. This has necessitated a systematic estimation if not an actual survey of the students who are attracted to each station. Another use made of such an estimate is to ascertain to what degree the student body, as the product of instruction of a station, compares with the educational aims or assumptions of the institution.

The student body at most biological stations is characterized by its heterogeneity. The students at any biological station, as at many other types of educational institutions, may be found to vary in their sex² and age, in their race³ and nationality⁴, in their training and occupation, and in their institutional connections. Thus persons enrolled in course work at many

larger stations include college professors and high school seniors, women interested in becoming nature counsellors and men training for research in theoretical science.

Public Education. — Aquariums. — In the nineteenth century, public aquariums were often associated in the public mind with biological stations. Even today thirty-four of these institutions maintain public aquariums. Many of these were built during the nineteenth century. While this tradition of maintaining aquariums associated with biological stations is strong in many parts of the world, it is not so in the United States. Only two United States biological stations possess these displays (*i.e.*, Scripps Institution of Oceanography and the Fisheries Biological Station at Beaufort, North Carolina).

While those biological stations which do have public aquariums are naturally concerned with public education, many incorporate aquariums into their function as a means of subsidizing the research work of the station. This plan was first conceived by Dr. ANTON DOHRN and today the number of visitors (and thus fees) received by the larger aquariums is substantial. The annual number of visitors to the aquariums of several large stations is as follows: 180,000 at Monaco in 1938, 73,260 at Helgoland in 1937, 40,000 at Naples in 1937, 43,045 at Port Erin in 1938, and 32,000 at Plymouth in 1937. To supplement the observations of the public at these larger aquariums, elaborate manuals describing the biological forms exhibited are often issued.

Museums. — These institutions are also occasionally sponsored by biological stations for public education. Most are marine museums associated with marine aquariums. Other types include museums of systematic biology (*e.g.*, The George M. Gray Museum of the Marine Biological Laboratory) and outdoor field museums (*e.g.*, Outdoor Museum of the Allegheny School of Natural History).

Botanical Gardens. — Especially in alpine regions, botanical gardens are operated in conjunction with biological stations. Eleven stations have such public botanical gardens. In addition to alpine gardens, there are tropical gardens (*e.g.*, Foreigner's Laboratory at Buitenzorg) and Indian gardens and nature trails (*i.e.*, Allegheny School of Natural History).

Public Lectures. — Laboratory tours and public lectures are sometimes included among the public education features of biological stations. The Allegheny School of Natural History, for example, scheduled a series of popular evening lectures once each week during the period that it was in session. This attracted a number of interested persons from the vicinity. Visiting days are also inaugurated at these institutions, both as educational features and to concentrate visits (and thus limit distractions) from the public to one day of each session.

Notes — (1) From a letter, dated March 25, 1940, to the author. — (2) Although most biological stations today admit women students, co-education was a debatable subject when these institutions were first established. LOUIS AGASSIZ, however, had no misgivings about allowing women to register as students in the Anderson School of Natural History. He once stated, "As soon as the number of students was limited, we determined a question of no small moment,—whether ladies should be admitted. In my mind I had no hesitation from the start. There were those about us whose opinion I had to care for but did not know, so I thought the best way was not to ask it, but

to decide for myself." Cf. *American Naturalist* 32:189-96, 1898. — (3) Both colored and white persons are generally admitted as students and investigators at biological stations. The late Dr. ERNEST E. JUST, famous Negro biologist, spent many years at Woods Hole (cf. *Science* 95 10-11). The few biological stations located in the Southern United States do not admit Negroes. These stations feel they must follow the unjust mores of their region rather than lead in the *application* of scientific truth as they lead in the *investigation* of scientific truth — (4) The student bodies of biological stations do not tend to be as international as the investigators at these institutions often are. The language barrier is one reason for this, since a person studying formally in a foreign country must be a better linguist than one doing research work. Another reason is that the course work at biological stations is generally duplicated at these institutions in many countries. There is not, therefore, the urgent need to cross national frontiers for course work as there is to do so in order to carry out investigations with rare forms or in unique environments. A third reason for the small proportion of foreign students at most biological stations, compared to the number of foreign investigators, is that most biologists have not attempted to excel as teachers. While an investigator might cross the ocean to work under the direction of a noted scientist, a person is less inclined to do so as a student, because there are fewer outstanding scientists with whom he may work at a biological station as a beginner. In certain instances, however, some foreign students may be found taking courses at biological stations. Systematic efforts should be made to facilitate the exchange of biological station students across international borders.

Research at Biological Stations: — Research is one of the primary functions of biological stations. Almost nine-tenths of these institutions offer research facilities. These are available to three types of persons: staff investigators, independent investigators, and student investigators. Several stations are prepared to accommodate all types, while others receive, for example, only independent investigators. Whatever the practices of the stations devoted to research, each type of investigator accommodated demands certain facilities from the station, while it in turn makes certain demands upon the investigator.

In addition to the living facilities and equipment offered to the different types of investigators, many biological stations attempt to furnish certain other opportunities to resident investigators and often also to research workers quite removed from the station. These include facilities for publication, supplies of biological specimens, and scientific symposia and conferences.

Research by Staff Investigators. — A portion of the research work done at almost nine-tenths of the biological stations is carried on by staff members of these institutions. The remaining stations either offer formal instruction exclusively, or are only prepared to offer facilities to visiting, independent investigators. The staff investigators who do pursue research problems are either permanent or part-time members, the latter often also giving formal instruction or supervising student research at the station.

Almost one-half of the biological stations maintain a permanent research staff. This practice varies with the customs of the countries in which these institutions are located. All of the Russian stations, for example, have a permanent staff, while none of the Algerian stations do. The larger countries with a high proportion of the field stations maintaining a permanent staff include Italy, Spain, Germany, and England. Those countries with a low proportion of stations with a permanent research staff have a complementary high proportion of stations with part-time staff investigators.

Permanent Staff and Program. — More than one hundred biological stations have a permanent, year-round staff. The actual number of staff members at these institutions varies from fifteen (*i.e.*, Scripps Institution

of Oceanography) to one (*e.g.*, Danish Arctic Station). The staff of more than one-half of these stations is composed of only one or two members. Only seventeen stations have five or more members of their permanent research staff. In addition, most of the larger stations have a number of full-time laboratory technicians, assistants, and administrative employees (especially librarians) who all aid in the research output of the institution.

The field stations which do have permanent staffs either do research on general biological problems or, due to sponsorship or location, concentrate their work in certain fields. Almost one-third of the stations specialize in research in marine biology. Other major fields of specialization at these institutions include fresh-water biology, fisheries, and oceanography.

Research institutions, especially in the more theoretical sciences, have often failed to bring about the coordination of personnel to the degree which some think to be necessary to make for the greatest efficiency in research. While this is often due to limited funds and equipment, it is perhaps equally due to lack of tradition for a type of teamwork in theoretical science that is comparable to that accomplished by the more practical scientific research institutions. At most biological stations with a permanent staff, the investigators — although staff members — work quite independently and their problems have little relation with each other. At a few biological stations, however, and especially at those dealing at least in part with applied biology, there is more of a closely correlated research program. There are evidences, too, that this coordination is slowly spreading to more biological station research programs.

The actual research programs of biological stations are too diverse for adequate generalization.¹ It may be said perhaps that these programs have attempted to keep abreast of the general trends in biological research, although some have lagged behind while others have pioneered for the science as a whole.

Part-time Staff and Program. — More than one hundred biological stations have a part-time staff of investigators. These persons are usually expected to do research during the period of the year that they are attached to the station or to do as much research as they are able after giving formal instruction or supervising student research at the station. The number of staff members of these institutions varies from twenty-two persons (*i.e.*, Marine Biological Laboratory) to one (*e.g.*, Royal Hydrobiological Station of Lake Trasimeno). Almost two-thirds of these stations have only one or two investigators, and the average part-time staff consists of three members. Twelve stations have five or more staff members, and ten of these are located in the United States. In addition to staff investigators, these institutions also employ part-time laboratory assistants and technicians to aid the investigators with the more routine laboratory and field tasks.

The biological stations with part-time investigators have less of a specialized research program than even those institutions with permanent staffs. The specialization of almost one-half of these biological stations with part-time staffs is due to its location either on fresh bodies of water or on the sea, while an additional one-third of these institutions pursue a research program in general biology. A few of these stations center their researches around such special fields as botany, ecology, or fisheries.

If the research program at those biological stations with a permanent staff is often uncoordinated, that at the institutions with a part-time staff is generally more so. Frequently the part-time investigator, although invited to undertake research work at the station, is also expected to supervise student research and give formal instruction. In such cases, whatever research the investigator does is secondary to any research program the station may have. The part-time staff member becomes, in reality, an independent investigator whose laboratory and often living fees are met by the station. The result is that the investigator spends his time completing previous research or inaugurating a project of his own interest which is often unrelated to that of his colleagues at the field station. A few of the institutions with part-time investigators do, however, have a well-correlated research program. This is due either to the part-time staff spending its full time in research or, less frequently, the retention of the same investigator year after year — a procedure not commonly adopted by most stations.

While stations in this category are characterized as institutions with a part-time staff, this does not necessarily mean that they are closed for a portion of the year. About one-quarter of these institutions are open throughout the year. Such stations may be open to staff investigators on a twelve-month basis, but the investigators are only hired on a part-time arrangement.

Research by Independent Investigators. — More than nine out of ten biological stations offer research facilities to independent investigators. Of the institutions which do not, a majority are biological nature camps which are concerned usually with elementary instruction. A few institutions do not admit visiting investigators because their limited budget can accommodate only members of their permanent staff (*e.g.*, Pacific Biological Station) or because the station is in the process of organization and has no facilities to offer visiting investigators (*e.g.*, Rocky Mountain Biological Station of the University of Michigan).

The biological stations which offer facilities to visiting investigators have various conditions for their admittance. Some institutions admit investigators in any biological subject quite unreservedly and with few formalities. Other stations carefully review the qualifications and proposed research program of the applicant and then he or she is admitted only if the research project coincides with the general aims of the station. In general, all stations at least want to know the problem the investigator will pursue and the time of his arrival, so they can better prepare for his investigations.

After the independent investigator is admitted to a biological station, he may or may not be assessed laboratory fees. More than one-half of the biological stations do not charge fees. About one-fifth of the institutions have laboratory fees which range from five to fifteen dollars a month, while another one-fifth charge monthly fees equivalent to more than fifteen dollars. The most expensive fee is one hundred dollars a month (*i.e.*, Mount Evans Laboratory).

A method whereby a field station obtains income from the facilities it offers, yet not from the individual investigator, is the so-called table system. This is believed to have been inaugurated by the Zoological Station of Naples. It has been adopted, with some alterations, by other institutions.²

As the laboratory fees or table arrangements differ, so do the facilities which biological stations put at the disposal of the visiting investigators. Some of the smaller stations permit the investigators to use whatever equipment is available. Others attempt to give the research workers as much complicated apparatus and as many special solutions as the institution can afford. In addition, stations often supply the investigators with fresh animal and plant forms daily, if required. The facilities offered to investigators and the procedures by which they may be obtained are often codified in the form of laboratory rules.

In addition to laboratory facilities, visiting investigators are often given certain concessions by virtue of their connections with some biological stations. Occasionally they are privileged to bring scientific apparatus into the country in which the station is located duty free (*e.g.*, Zoological Station of Naples). Some stations obtain reduced transportation rates for research workers (*e.g.*, Bermuda Biological Station for Research, Inc.). Other stations which are not able to provide full living facilities to investigators also may obtain reductions in living costs at nearby hotels or restaurants for them (*e.g.*, Jungfrauoch Scientific Station).

In furnishing laboratory facilities to independent investigators, biological stations do so with the implied agreement that the worker will do his best to contribute to the progress of science. Most stations ask no more of the investigator. Some of these institutions, however, expect that the investigator will partially repay the station in one of several tangible ways. These include identifying animal and plant forms, acknowledging indebtedness to the station in printed reports of any work done at the station, compiling a separate report of research undertaken, and donating reprints of any published research to the station library.

The number of investigators who take advantage of the facilities offered by biological stations varies with the time of the year and — over longer periods of time — with economic and international conditions. About three-quarters of the stations which offer facilities to investigators of this type are open throughout the year. As only a few independent investigators are on year-round fellowships or sabbatical leaves of absence, the summer months or short periods at Easter recess are the only time that the majority of research workers are able to make use of these facilities. As a rule, therefore, many of these stations are crowded in the summer months and — if open at all — are quite empty in winter.

The maximum number of investigators which these institutions can accommodate at any one time varies from two (*e.g.*, Marine Laboratory of the University of Sydney) to more than 250 (*i.e.*, Marine Biological Laboratory). More than two-thirds of these institutions accommodate no more than ten visiting investigators. Those stations which have facilities for more than twenty-five independent investigators include the institutions at Bermuda, Salisbury Cove (Maine), Plymouth, Villefranche, Helgoland, Naples, and Woods Hole (Marine Biological Laboratory).

The actual research work done by the independent investigator at biological stations is often in the field. There are instances, however, where the investigations are carried on exclusively in the laboratory, often with such forms as rabbits and mice. The investigations may be in a phase of theoretical biology or in one of the applied or border-line fields. Some are

life-time problems and others are projects which may be completed in a few weeks.

Research by Advanced Students.—Almost one-half of the biological stations are known to be equipped to receive advanced students who desire to do research work under direction. These institutions are, for the most part, stations which offer formal instruction, although in some instances stations devoted exclusively to research provide for the training of research investigators (e.g., Woods Hole Oceanographic Institution). The supervisors of student research are usually faculty members also offering more formal class-work, although they may be permanent or part-time staff investigators who are qualified to direct research by their academic affiliation or attainment.

The conditions under which students are admitted to do research under direction vary considerably. A few stations allow undergraduate students to undertake research (e.g., the Bowdoin Scientific Station is organized primarily for this purpose). Most field stations, however, offer such facilities only to graduate students who are working for a higher degree. Admission requirements in such cases usually coincide with those of the institutions which grant the degree.

Since the research work done at biological stations is often under the official direction of the institution which awards the advanced degree, the fees for such supervision of student research are controlled usually by the university concerned. These do not, however, differ greatly from those charged students taking formal course work. A number of student investigators are subsidized in their studies by fellowships and scholarships granted by the universities to which they are attached. In addition, several biological stations offer special fellowships to advanced student investigators.

The actual research done under supervision at biological stations includes field and laboratory work in many branches of biology. Many of the problems are of a relatively limited scope, often being connected with the larger work or interest of the supervising faculty member. Some of this research is written up as theses in partial fulfillment for advanced university degrees. In other instances, the studies are preliminary.

Facilities for Publication.—Biological stations occasionally offer staff and independent investigators opportunities for the publication of the results of their researches. These facilities are in the form of serial publications issued by the field station. A few of these serials are published bi-monthly (e.g., *Biological Bulletin* of the Marine Biological Laboratory), while others are issued annually (e.g., *Bulletin of the Mount Desert Island Biological Laboratory*). A number are issued only occasionally (e.g., *Fauna et Flora Laurentianae* of the St. Lawrence Biological Station).

The material in these publications of biological stations is generally limited to reports of research undertaken at the station (e.g., *Palao Tropical Biological Studies*), although sometimes they include papers reporting investigations conducted elsewhere (e.g., *Der Vogelzug* of the Rossitten Bird Observatory). While most of the material in these serials is the result of scientific work, space is devoted in some of these publications to reports of the general work and financial condition of these institutions (e.g., *Annual*

Report of the Freshwater Biological Association of the British Empire). The larger stations are able to separate the types of articles included in these publications by issuing several kinds of serials (e.g., *Thalassia* and *Note* of the Italian-German Institute of Marine Biology).

The oldest serial publication issued by any biological station is believed to be the *Fauna et Flora del Golfo di Napoli*. This was first published by the Zoological Station of Naples in 1880. The most recent serial bulletin to be established by a biological station is the *Publication of the Marine Biological Station, Ghardaqa* (1939). Several well-known publications of biological stations have been compelled, for one or more reasons, to discontinue or at least merge with other journals. These include *Mittheilungen aus der Zoologischen Station zu Neapel* (which became *Pubblicazioni della Stazione Zoologica* after its twenty-second volume), *Travaux du Laboratoire de Zoologie et Physiologie maritime à Concarneau* (which was discontinued during the first World War), and *Wissenschaftliche Meeresuntersuchungen, Abth. Helgoland* (which since June 1937 has been *Helgoländer Wissenschaftliche Meeresuntersuchungen*).

In addition to providing publication facilities to research investigators, biological stations are able to use these serials to obtain similar journals from other scientific institutions by means of exchanges. Those stations which do not publish serials occasionally issue a limited edition of collected reprints of published research work done at the station (e.g., *Collected Reprints* of the Woods Hole Oceanographic Institution). These, too, are frequently used for exchange purposes.

The research papers of investigators at the biological stations which do not publish scientific serials usually appear in the appropriate journals of other scientific institutions or organizations. In some instances, certain journals quite independent of the biological station often receive most of the research papers originating from that station. Thus many articles describing the results of research undertaken at the Zoological Station of Algiers appear in *Bulletin de la Société d'Histoire Naturelle Afrique du Nord*. Often an institution sponsoring a biological station publishes the research work of that station in its scientific publications. Thus many of the researches completed at the Allegany School of Natural History have appeared in the various publications of the New York State Museum which, for some years, was a co-sponsor of that station.

The Supply of Biological Specimens.—A method by which biological stations contribute to research and instruction is the collection and sale of preserved and living biological specimens. Some biological stations were organized because biologists for their research and instructional needs were unable to obtain necessary biological forms. Laboratories were therefore set up where these could be more easily obtained. Now some of these very same laboratories are making it possible for biologists to receive living and preserved specimens many hundreds of miles away from the natural environment of these forms.

At least twelve biological stations have well-organized biological supply departments. These include the stations located at Amoy, Plymouth, Wray Castle, Helgoland, Krefeld, Ennur, Naples, Rovigno, Helder, Portobello, Millport, and Woods Hole (Marine Biological Laboratory). Some of these

departments do a relatively small annual business, although that of the Marine Biological Laboratory had a gross income of almost \$40,000 in 1938. Most of these supply departments issue some kind of price-list for prospective individual and institutional purchasers.

The disadvantage of this auxiliary service of a biological station is that many of the materials must be collected in the immediate neighborhood of the laboratory. The type of wholesale collecting which it is necessary for most supply departments to do often negates the advantages, both financial and scientific, of operating this service.

Scientific Lectures and Conferences. — A method used by a few of the larger biological stations to promote the advancement of science in general is the sponsoring of scientific lectures and conferences. Some stations schedule a series of scientific lectures to be delivered at the station by staff members, visiting investigators, or special lecturers. These talks are sometimes about subjects of general biological interest, while at other times they are on very specialized topics. In both cases, they result in a broadening of the knowledge and interests of those research investigators attending them. Often information on the results of unpublished scientific experiments and observations are divulged for the first time at these talks.

Biological stations are occasionally hosts to various biological symposia, conventions, and congresses. The Symposia on Quantitative Biology of the Biological Laboratory of the Long Island Biological Association are perhaps the most noted of such conferences to be sponsored by field stations in recent years. While this symposium has been inaugurated by the station and is an annual event, others are organized by independent scientific organizations and convene at the biological station for only a single occasion. When the Fourth Pacific Science Congress met in Java in 1929, the Visitors' Laboratory at Buitenzorg was host to many visiting botanists. In North America, the Genetics Society has held summer meetings at the Marine Biological Laboratory for several years. Such conferences at biological stations often introduce students and investigators to the visiting scientists and they, in turn, are introduced to the work and potentialities of the station.

Notes. — (1) A splendid account of the research program for the first twenty years at one station is given by FRANK R. LILLIE: *The Woods Hole Marine Biological Laboratory*. University of Chicago Press, pp. 115-56, 1944. — (2) These table systems have helped to make possible the international exchange of investigators at biological stations. Few systematic attempts have been made in peacetime to overcome the normal difficulties of foreign research and thus facilitate the interchange of investigators.

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The following directory brings together information on 271 biological stations in fifty-nine political areas. The description of each station has been necessarily limited to fit within the format of this study. An attempt is made, however, to give at least the following enduring facts about each station: the location, the name, the sponsoring organization, the purpose, the unique equipment, and the name of its scientific publications. Less often information is given on the biological surroundings of the station, the date of foundation, and the time of year the station usually has been open (if

normally closed for a portion of the year). Occasionally less permanent but often indicative information is given, such as the annual budget, the name of the director, the number of resident scientific investigators, the type and size of boats, and a description of the course work offered. No attempt is made to give the most recent information available on the names of staff members, the number of menial employees, the size of the library, the cost of board and lodging, the maximum number of students accommodated, tuition costs, and the fees assessed independent investigators.

An attempt is also made to give for most stations a fairly complete listing of existing bibliographic references to descriptions of them and their facilities. Space has not been sufficient to give the titles, authors, and dates of these articles, but for convenience the references are listed in chronological order (the first given being the oldest). Perhaps the most consistently useful descriptions of many of these institutions are found in the previous, older catalogues of biological stations. These have been abbreviated in this directory as follows:

- Chronica Botanica ..Chronica Botanica Co Leyden, Zuid-Holland and Waltham, Massachusetts. Vol I (1935) *seq*
- DEAN 1894....DEAN, BASHFORD Notes on marine laboratories of Europe Report of the Smithsonian Institution for 1893 505-19, 1894.
- JUDAY 1910....JUDAY, CHANCEY Some European biological stations. Transactions of the Wisconsin Academy of Sciences, Arts, and Letters 16:1257-77, 1910.
- KOFOID 1910... KOFOID, CHARLES ATWOOD The biological stations of Europe. United States Bureau of Education Bulletin 1910(4) 1-360, 55 pls, 48 figs. 1910.
- LENZ 1927....LENZ, F. Limnologische Laboratorien Handbuch der Biologischen Arbeitsmethoden 9, 2(1):1285-1368, 1927.
- MAGRINI 1927 ... MAGRINI, G Instituts et laboratoires s'occupant de l'étude de la mer. Conseil International de Recherches, Union Géodésique et Géophysique Internationale, Section d'Océanographie, Bulletin 7:1-115, 1927.
- RICKER 1937.... RICKER, W. E. Glimpses at fishery biology and fish culture in Europe. Progressive Fish Culturist 31:29-33; *Ibid.* 32:12-15; *Ibid.* 34:12-14, 1937.
- SAND 1898 . SAND, RENÉ. Les laboratoires maritimes de zoologie Revue de l'Université de Bruxelles 3 23-47, 121-51, 203-35, 1898.
- SCOURFIELD 1905.... SCOURFIELD, D. J Fresh-water biological stations Jour Quekett Micro. Club II, 9(56) 129-36, 1905.
- Turttox....General Biological Supply House Biological field work 1928-32, 1934, 1935, 1937. Chicago, Illinois
- VAUGHAN 1934.... VAUGHAN, T. W. Catalogue of marine stations of the Pacific. International Commission on the Oceanography of the Pacific, Report of the Chairman. Fifth Pacific Science Congress Proceedings 1:361-80, 1934.
- VAUGHAN 1937.... VAUGHAN, T. W. Catalogue of institutions engaged in oceanographic work. In International aspects of oceanography (T. W. VAUGHAN and others) 225 pp. Washington: National Academy of Sciences. 1937, pp 73-225.

DIRECTORY of BIOLOGICAL STATIONS

It must be re-emphasized that, with few exceptions, the descriptive accounts given here are corrected to 1940—before World War II became world-wide. As the war progressed, many of these institutions curtailed their activity and some even suspended operation. Despite these changes wrought by the war, it has been thought useful for biologists and others to have a picture of these institutions at perhaps the peak of their operation (1939-40)*.

— ALASKA —

Little Port Walter (Baranof Island): **Field Laboratory of the United States Fish and Wildlife Service**:—About 18 miles from the open ocean, with one stream flowing into the bay and that originating in a series of mountain lakes. Established in 1941 by the U. S. Fish and Wildlife Service for the study of the natural reproduction of pink salmon. Laboratory and living facilities are available for visiting biologists. — *Cf.* Science 94:295.

— ALGERIA —

Algiers: **Station Zoologique d'Alger**:—Founded in 1888, this institution is conducted by the Faculty of Sciences of the University of Algiers. There is a two-story laboratory building. — *Cf.* La Nature 16(2):327-30; SAND 1898; VAUGHAN 1937.

Beni Ounif: **Laboratoire de Biologie Saharienne**:—Sited in a stony desert near a date palm oasis and ten miles from the mountains of Morocco. Founded in 1930 and attached to the Faculty of Sciences of the University of Algiers. The building contains four laboratories and a herbarium. — *Cf.* Chronica Botanica 1938.

Maison-Carrée. **Station Botanique de Maison-Carrée**.

— ARGENTINA —

Quenquén. **Estacion de Biología Marina del Museo Argentino de Ciencias Naturales de Buenos Aires**.

— AUSTRALIA —

Cronulla (New South Wales): **Commonwealth Fishery Research Laboratories**:—Sponsored by the Council for Scientific and Industrial Research of the Commonwealth of Australia. There are two large, well-equipped laboratory buildings. Two-ton truck available as a mobile laboratory for coastal work. Several large boats available, including 82-foot, 138-ton M. V. Warreen — *Cf.* Nature 144:312-13; VAUGHAN 1937.

Narrabeen (New South Wales). **Biological Field Station of the Sydney University Biological Society**:—Founded in 1934 and sponsored by the Sydney University Biological Society. In a suburb of Sydney, where there are laboratory and living accommodations. — *Cf.* Nature 134:602, 623; Chronica Botanica 1:81; *Ibid.* 2:73.

Port Jackson (New South Wales). **Marine Laboratory of the University of Sydney**:—Sited in Sydney harbor and equipped for research and instruction in marine biology and oceanography. Sponsored by the Department of Zoology of the

* Beyond the scope of this directory are accounts of the numerous biological stations of the past (*cf. supra*, p. 10-11). — Dr. VERDOORN has expressed his willingness to publish a historical account of these stations. Much material concerning them may be found in my manuscript thesis (*cf. supra*, p. 5). In the CHRONICA BOTANICA ARCHIVES there is a file of several thousand cards dealing with the history of botanical gardens, museums, etc. This includes quite some data concerning early biological stations (*cf.* CHRONICA BOTANICA 8:445).

University of Sydney with funds contributed also by the Australian Research Council and the Commonwealth Council for Scientific and Industrial Research. 13-ton auxiliary yacht with oceanographical apparatus available. — Cf. Science 74:202; VAUGHAN 1934; VAUGHAN 1937.

— BELGIUM —

Ostend: Institut Maritime de Belgique:—Founded in 1900, reorganized in 1935 and now connected with the Royal Museum of Natural History of Brussels.—Research published in *Annales de l'Institut Maritime de Belgique*.—Cf. VAUGHAN 1937.

Rouge-Cloître (Brabant): Laboratoire de Biologie Lacustre.

Sourbrodt: Station Scientifique des Fagnes:—Located in the bogs of the Belgian Ardennes at an altitude of 2,211 feet. Founded in 1928 by the University of Liège and under the supervision of Professor RAY. BOUILLENNE. The station is open normally from June to October and both laboratory and living accommodations are available.—Cf. Bull. Soc. Roy. Bot. Belg. 58:20-24; Chronica Botanica 1:93; *Ibid.* 2.85.

— BERMUDA —

St. George's: Bermuda Biological Station for Research, Inc.:—Founded in 1903 at Flatts, Bermuda and moved to present location in 1932. Sponsored to offer facilities for research in biology and oceanography in the Bermuda region by an international board of trustees on which are representatives from Bermuda, England, Canada, and the United States. The 12-acre plant includes complete laboratory and living facilities Oceanographic research vessel, Culver, attached to the station, as is a 24-foot launch. Investigators may obtain reduced steamship rates and exemption from paying customs on their scientific supplies and equipment.—*Station publications*: report of the officers; contributions, Bermuda Biological Station for Research, Inc. (1931-); and Collected Reprints, Bermuda Biological Station for Research, Inc.—Cf. Chambers Jour. 6(7):783-84; Pop. Sc. 66:393-411, 556-72; Science 65:128-30; *Ibid.* 73:488-89; *Ibid.* 75:133-36; Nature 139:948-51; Science 89:28; *Ibid.* 94:319; Chronica Botanica 1935; *Ibid.* 1936; *Ibid.* 1938; Turttox 1937; VAUGHAN 1937.

— BRAZIL —

Alto da Serra: Estação Biológica do Depto. de Botânica do Estado:—Near São Paulo at an altitude of 2,400 feet in a virgin sanctuary for native animals and plants. Founded in 1909 and now supervised by Professor F. C. HOEHNE.—Cf. Ber. Deutsch. Bot. Ges. 50:154-64; Scientific Monthly 25:5-8; Chronica Botanica 1935; *Ibid.* 1936.

Itatiaia (Rio de Janeiro): National Park and Biological Laboratory.

— BULGARIA —

Varna: Biological Station and Aquarium:—Situated on the Black Sea near a rocky and sandy shallow-water zone which is rich in animal and plant life and thus equipped for research and instruction in marine biology. Begun in 1906 but not opened until 1932 and now sponsored by the University of Sofia. There is a 3-story laboratory building which contains a public aquarium, research laboratories, dormitories, and a library. Courses are offered in hydrobiology and natural history for teachers.—*Station publication*: Arbeiten aus der Biologischen Meeres-station am Schwarzen Meer.—Cf. Int. Rev. Hydrobiol. 1:745-46; *Ibid.* 29:157-58; JUDAY 1910; KOFOD 1910.

— CANADA —

Algonquin Park (Ontario): Ontario Fisheries Research Laboratory:—Sponsored by the University of Toronto for research of fisheries resources. Founded in 1919-20, the laboratory was moved to present site in 1936 and now is under the direction of Professor WILLIAM J. K. HARKNESS. Laboratory and living accommodations are available.—*Station publication*: University of Toronto Studies, Biological Series. Publications of the Ontario Fisheries Research Laboratory (1922-).

Kent Island (New Brunswick): Bowdoin Scientific Station:—Founded in 1935 by WILLIAM A. O. GROSS of Bowdoin College (U.S.A.) to inspire research in biology and meteorology by undergraduates. Six, well-equipped buildings are available for

research from June fifteenth to September fifteenth. — *Station publications*: Contributions from the Bowdoin Scientific Station (1938-); and annual report (mimeographed). — *Cf.* Natural History 37:195-210.

Nanaimo (British Columbia): **Pacific Biological Station**: — Sponsored by the Fisheries Research Board of Canada for scientific investigation of marine and fresh-water problems. Dr. W. A. CLEMENS directs the large plant, which includes many well-equipped laboratories, museum, library, dormitory, kitchen, and staff offices. A 60-foot boat is available for oceanographical investigations — *Cf.* Proceedings and Transactions of the Royal Society of Canada 3(2):lxxiii-lxxiv; Fifth Pacific Science Congress 1:200; MAGRINI 1927; Turttox 1937; VAUGHAN 1934; VAUGHAN 1937.

St. Andrews (New Brunswick): **Atlantic Biological Station**: — Sponsored by the Fisheries Research Board of Canada to provide facilities for research on fresh and salt-water fisheries. It is on the shore of a deep, tidal estuary of the St. Croix River. There are several laboratory buildings, experimental aquarium tanks and pools, a 90-foot diesel-engine research vessel, Zoarces, and a 28-foot vessel, Delphine. — *Cf.* Proceedings and Transactions of the Royal Society of Canada 2(4):xiii; *Ibid.* 2(5):xxi-xxii; *Ibid.* 2(6):xiii-xv; MAGRINI 1927; Turttox 1937; VAUGHAN 1937. Bot. Gaz. 27:79.

Trois-Pistoles (Province of Quebec): **Station Biologique du St.-Laurent**: — Located on the south shore of an estuary of the St. Lawrence River for the purpose of studying the hydrography, flora, and fauna of the region. Founded in 1931 by Laval University and now sponsored by this institution. Professor ALEXANDRE VACHON directs the work of this station which consists of a 2-story laboratory building and the 50-foot boat, Laval. — *Station publications*. Rapports annuels (1932-); Contributions de la Station Biologique du Saint Laurent (1932-); Fauna et Flora Laurentianae (1936-). — *Cf.* VAUGHAN 1937.

— CAROLINE ISLANDS —

Korror Island: **Palao Tropical Biological Station**: — Sponsored by the Japanese Society for the Promotion of Scientific Research for research in the biology of coral reefs. Professor S. HATAI is the director of the station which is housed in a one-story building. — *Station publication*: The Palao Tropical Biological Studies. — *Cf.* Nature 140:735; VAUGHAN 1937.

— CEYLON —

Colombo: **Fisheries Research Station**.

Peradeniya: **Visitors' Lab. of the R. Botanic Garden**.

— CHILE —

Corral: **Estación de Oceanografía**.

— CHINA —

Amoy (Fukien Province): **Amoy Marine Biological Station**: — (This station has moved inland to Tingchow for the duration.) Founded in 1934 to promote the study of marine biology by the University of Amoy. Professor T. Y. CHEN is director of the station which offers a course in marine biology during the summer months. — *Station publications*: Amoy Marine Biological Bulletin; Annual Report of the Amoy Marine Biological Station (in Chinese). — *Cf.* Science 72:429-30; VAUGHAN 1934; VAUGHAN 1937.

Sen-Kia-Men (Chusan Islands, Chekiang); **Tinghai Marine Station**: — Founded in 1936 for biological and oceanographic research and later sponsored by the National Research Institute of Biology. — *Cf.* VAUGHAN 1934; VAUGHAN 1937.

Tsingtao (Shantung): **Tsingtao Marine Biological Station**: — Sponsored by the Academia Sinica and several other societies. The building was started and almost completed in July 1937, when the war started.

— CUBA —

Habana. Institute for Marine Biology:— The establishment of a new institute of marine biology has recently been authorized by the Dept. of Agriculture of the Govt. of Cuba. It is being located at Castillo de la Punta. The institute will include a library, a museum, a div. of "industrial experimentation", etc.

Soledad. Atkins Institution of the Arnold Arboretum:— Founded in 1898 by EDWIN F. ATKINS and now sponsored by Harvard University for tropical research in botany and zoology. Professor THOMAS BARBOUR directs the work of the station which is housed in one well-equipped laboratory building. There are separate living quarters and a 200-acre botanical garden devoted to the cultivation of economic plants. There are accommodations for six investigators at one time.— Cf. Science 59 433-34; Jour. of Heredity 15:451-61; Bul. Pan-American Union 70:631-38; Sci Mon 51.140-46; Science 94:534.

— CZECHOSLOVAKIA* —

Blatná. Station für Hydrobiologie und Fischzucht an den Lnáreteichen:— Cf. LENZ 1927; Chronica Botanica 1936.

Hirschberg [Doksy] (Bohmen): Station Hirschberg a. See der Reichsanstalt für Fischerei:— Founded in 1905 by Dr. VIKTOR LANGHANS for hydrobiological research. Dr. TRUDE SCHREITER directs the work of the station which is housed in a 3-story building.— Cf. Verein der Naturfreunde in Reichenberg 60.46-49; KOFOID 1910; LENZ 1927.

Krtiny (Moravia): Biologická Stanice Českých Vysokýchškól Brněnských:— Sponsored by the Czechoslovakian Academy of Sciences and the Ministry of Education for research in general biology in a region of hilly lands and ponds.— Cf. LENZ 1927; Chronica Botanica 1935.

Samorín (near Bratislava): Biologická Stanice Komenského University:— Cf. Chronica Botanica 1936.

Strbské Pleso (Vysoké Tatry): Geobotanical Station of the Czechoslovakian Botanical Society:— Founded in 1931 and now sponsored by the Czechoslovakian Botanical Society for research in botany, ecology, and phyto-sociology. Station open to investigators from May first to November first.

Velké Meziříčí (Mahren): Die Franz Harrach'sche Station für Fischerei und Hydrobiologie:— Founded in 1928 by FRANZ HARRACH and now an independent institution. There is one, well-equipped building.

— DENMARK —

Charlottenlund Slot (Copenhagen): Dansk Biologisk Station:— Situated on the narrow sound separating Denmark from Sweden south of the Kattegat, with a fresh-water annex at Frederiksdal. Sponsored by the Danish Ministry of Agriculture and Fisheries for investigations on marine and fresh-water problems. Dr. H. BLEGVAD directs the work of the station, which has a budget of 140,000 Kroner. Laboratory headquarters are in Charlottenlund Castle. 143-ton research steamer, Biologen, available for research problems between April first and October twentieth.— *Station publication:* Report of the Danish Biological Station (1890-91-).— Cf. Revue Générale des Sciences 47.623-30; SAND 1898; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937; RICKER 1937.

Frederikshavn: Universitetets Havbiologiske Laboratorium.

Hillerød: Universitetets Ferskvandsbiologiske Laboratorium:— Situated on the shore of shallow Frederiksborg Castle Lake for the purpose of research and instruction in freshwater biology. Sponsored by the University of Copenhagen under the direction of Professor KAJ BERG. There is a 2-story, well-equipped laboratory building. A 3-week course is offered in summer to university students in fresh-water biology.— Cf. Int. Rev. Hydrobiol. 3:128-35; Arch. für Hydrobiol. 32(4):1-6; SCOURFIELD 1905; KOFOID 1910; JUDAY 1910; LENZ 1927; RICKER 1937.

Noudby (Skalling Peninsula): Skalling-Laboratoriet:— Sponsored by the Carlsberg Foundation for investigations of marshes, dunes, and sandflats. Two field laboratories are available to investigators, one in Noudby Harbor and another on Skalling Peninsula.— *Station publication:* Meddelelser fra Skalling-Laboratoriet (1935-).

* Territorial boundaries as of August 1938

— EGYPT —

Alexandria: Fouad I Institute of Hydrobiology and Fisheries:—Founded in 1931 and now sponsored by the Egyptian Ministry of Commerce and Industry for research on the marine and fresh-water fishes of Egypt. Dr. HUSSEIN FAOUZI is the director of a staff of five research assistants. The 3-story laboratory building contains a public aquarium, offices, library, museum, and many well-equipped laboratories. Services of the government, 42-meter Mababiss, are available.—*Station publication:* Notes and Memoirs of the Fouad I Institute of Hydrobiology and Fisheries (1933-).—*Cf.* Int. Rev. Hydrobiol. 30:383; Nature 141:1107; VAUGHAN 1937.

Ghardaqa: Marine Biological Station of the Fouad I University:—Founded in 1930 by Dr. CYRIL CROSSLAND for the Faculty of Science of the Fouad I University. On the Red Sea, at the most northerly extension of the Indo-Pacific fauna. Every variety of coral reef is to be found within easy reach of the station. There are several well-equipped laboratory and living buildings. Boats are available. The station is open throughout the year, although optimum climatic and collecting conditions are during the summer months.—*Station publications:* Announcement; Publications of the Marine Biological Station, Ghardaqa (1939-).—*Cf.* Nature 126: 991-93; *Ibid.* 134:743-44; Chronica Botanica 1935; VAUGHAN 1937.

Heliopolis (Cairo): Institute of Desert Researches.

— EIRE —

Lough Inc (Skibbereen, County Cork): Cork University Biological Station:—On a tidal marine lough communicating with the sea by a very narrow-stepped channel. Founded in 1925 by Professor LOUIS P. W. RENOUF and now sponsored by University College, Cork, for the purpose of working out the ecology of the immediate neighborhood and providing research facilities to visiting biologists. Courses offered in marine biology and ecology.—*Cf.* Journal of Ecology 19(2):410-38.

— ENGLAND —

Ambleside (Westmoreland): Laboratory of the Freshwater Biological Association of the British Empire:—Founded in 1929 to promote the investigation of the biology of the animals and plants found in fresh (and brackish) waters. Sponsored by the Freshwater Biological Association of the British Empire with a budget of £4,084. Dr F. B. WORTHINGTON is director of a staff of seven resident investigators. The station is housed in Wray Castle and is equipped with modern laboratory and living facilities. A course is offered in the principles of freshwater biology.—*Station publications:* Annual Report of the Freshwater Biological Association of the British Empire; Scientific Publication (1939-).—*Cf.* Science 72:554; Nature 125:241-42; Science 76:248; Nature 130:140; Int. Rev. Hydrobiol. 30 247-50; Nature 142:238, Chronica Botanica 1938 and 1939.

Blakeney Point (Norfolk): Blakeney Point Research Station:—Situated on a peninsula on the Norfolk coast, with sand dunes, salt marshes, and mud flats easily accessible. Founded in 1913 for research in the ecology and ornithology of the region.—*Station publications:* Blakeney Point Publications (1912-); Occasional Reports of the Blakeney Point Research Station (usually appearing in the Transactions of the Norfolk and Norwich Naturalists' Society).

Cullercoats (Northumberland): Dove Marine Laboratory:—Founded in 1897 by Prof. ALEXANDER MEEK and now sponsored by Armstrong College of the University of Durham, with A. D. HOBSON as director. The 2-story laboratory building contains rooms for the classes held each Easter holiday.—*Station publication:* Dove Marine Laboratory Report.—*Cf.* JUDAY 1910; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

Plymouth: Plymouth Laboratory of the Marine Biological Association of the United Kingdom:—The Devon and Cornwall shore line supports an extensive and varied fauna which is exposed by the considerable rise and fall of the tide. The station was established in 1884, opened in 1888, with additions erected in 1920, 1922, 1926, and 1939. It is sponsored by the Marine Biological Association of the United Kingdom on a budget of £16,000 annually. Dr. STANLEY KEMP is director and there are twelve resident members of the staff. The plant consists of three, well-equipped laboratory buildings which contain a public aquarium, a 20,000-volume library, biological supply

sales department, classrooms, and research laboratories. The 88-foot steamer, *Salpa*, is equipped for trawling and plankton work and the 25-foot motorboat, *Gammarus*, is also available. Courses in marine biology are offered during the Easter and autumn vacations. Laboratory accommodations are available for thirty investigators in addition to the resident staff. — *Station publications*: *Journal of the Marine Biological Association of the United Kingdom* (1889-); *Report of the Council*; *Syllabus of the Course in Marine Biology*; *Guide to the Plymouth Aquarium*. — *Cf.* *The Times*, London, March 31, 1884; *Ibid.* April 1, 1884; *Nature* 30:40, 82, 323, 350-51; *Jour. Marine Biol. Assoc.* 1:96-104; *Nature* 38:16-17; *Ibid.* 38:198-200; *Ibid.* 38:236-37; *Jour. Marine Biol. Assoc.* 15:734-828; *New Statesman* 28:105-06; *Science* 76:586; *Ibid.* 93:445; DEAN 1894, SAND 1898; JUDAY 1910; KOFOID 1910; MAGRINI 1927; *Chronica Botanica* 1935; *Ibid.* 1936; VAUGHAN 1937.

Port Erin (Isle of Man): **Marine Biological Station at Port Erin**. — On the Isle of Man in the middle of the Irish Sea and organized to provide research and instructional facilities in marine biology. Sponsored by the Department of Oceanography of the University of Liverpool with Prof. J. H. ORTON as director. There is a well-equipped, 2-story laboratory building and one 20-foot motorboat. Courses are given by professors of public schools and universities who come to the station with their classes for 2-week sessions, usually during the Easter recess. — *Station publications*: *Report of the Marine Biological Station at Port Erin* (1888-); *Memoirs on Typical British Marine Plants and Animals of the Liverpool Marine Biological Committee* (1899-); *Proceedings and Transactions of the Liverpool Biological Society* (1886-); *General Regulations for Students*. — *Cf.* *Int. Rev. Hydrobiol.* 1:740-45; *Nature* 82:321-22; *Proc. Trans. Liverpool Biol. Soc.* 34:23-74; *Nature* 146:58; *Science* 95:473; DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; MAGRINI 1927; *Chronica Botanica* 1936; VAUGHAN 1937.

Potterne (Wilts.) **Potterne Biological Station**. — *Cf.* *Chronica Botanica* 1:178, *Ibid.* 2:190.

Southampton **Southampton Fisheries Station**. — On the River Itchen within easy access to a large variety of water conditions. Founded in 1932 as the Avon Biological Research Station by University College, Southampton, and now sponsored also by the Freshwater Biological Association of the British Empire. — *Station publication*: *Annual Report of the Avon Biological Survey* (1932-) — *Cf.* *Chronica Botanica* 1939.

— ESTONIA —

Tartu. Kuusnõmme Bioloogia Jaam.

— FINLAND —

Tvärminne. **Station Zoologique de Tvärminne**. — Readily accessible to the station is open sea (the Gulf of Finland) and also a long, fiord-like bay. Founded in 1902 and now sponsored by the University of Helsingfors with Prof. ALEXANDER LUTHER as director. There is a 2-story building which is open to independent investigators from May fifteenth to September tenth. 3-week courses are given in aquatic zoology, hydrology, and plant physiology. — *Cf.* LENZ 1927; *Jahresb. Westpr. Bot.-Zool. Ver.* 47:67-68.

— FRANCE —

Aix-les-Bains (Savoie) **Station d'Etudes Hydrobiologiques du Lac du Bourget**. — In a region of many large and small lakes, two large rivers, and easily accessible to the lakes of higher altitude in the Savoian and Dauphin Alps. Sponsored by the National School of Waters and Forests at Nancy to facilitate biological researches on the fresh-water lakes in France. The 2-story building contains a public aquarium, library, research laboratories, and living rooms. Open from April to October to qualified investigators. — *Cf.* *La Nature*, Paris 65(1):401-03.

Ambleteuse (Pas-de-Calais) **Station Biologique de l'Université Catholique de Lille** (**Laboratoire Charles Maurice**). — Established in 1895 by Prof. CHARLES MAURICE and now sponsored by the Catholic University of Lille. There is a laboratory building and also a chalet used for living accommodations. — *Cf.* KOFOID 1910; MAGRINI 1927.

Arcachon (Gironde): **Station Biologique d'Arcachon**. — Initiated in 1863 and sponsored by La Société scientifique d'Arcachon, with Prof. H. SIGALAS as director. The

two buildings contain a public aquarium, museum, well-equipped research laboratories, and living accommodations. A 31-foot motorboat is available. — *Station publications*: Bulletin de la Station Biologique d'Arcachon (1895-); Règlement des Laboratoires. — Cf. DEAN 1894; SAND 1898; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

Bagnères-de-Bigorre (Hautes Pyrénées): **L'Institut et Observatoire de Physique du Globe du Pic-du-Midi**: — On the summit (9,437 feet) of a mountain in the Pyrenees. Sponsored by the University of Toulouse to aid scientists in making available to them laboratory and living facilities for research in physics and biology in high altitudes. The two weather-proof buildings contain well-equipped laboratories, library, and living quarters.

Banyuls-sur-Mer (Pyrénées Orientales): **Laboratoire Arago de Banyuls-sur-Mer**: — Sponsored by the Faculty of Sciences of the University of Paris for research and instruction in marine biology. Prof. E. CHATON is director and there is a resident scientific staff of three persons. The plant contains a public aquarium, museum, library, classrooms, living accommodations, and well-equipped laboratories. A two-week course in marine biology is given usually during the Easter vacation and again in September. — Cf. Revue Scientifique 3(1):577-79; Arch. Zool. 1(9) 563-98; Revue Scientifique 35 371-74; La Nature, Paris 14 97-99, Revue Scientifique 47.673-80; Revue des deux Mondes 120 168-86; Arch. Zool. 3(3) 1-42; *Ibid.* 3(6):1-35, *Ibid.* 3(9) 1-42, Cosmos 55 367-70; Revue Scientifique 70 750-53; DEAN 1894; SAND 1898, JUDAY 1910; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

Besse (Puy-de-Dôme): **La Station Biologique de Besse**: — At an altitude of 3,444 feet, in a region of more than 20 lakes of glacial and volcanic origin. Sponsored by the Faculty of Sciences of the University of Clermont for the purpose of studying the flora and fauna of the mountains, especially the limnology of the waters. The laboratory building contains living facilities and also classrooms for the two-week course given for university students in biology. — *Station publication*: Arvernia Biologica (including Annales de la Station Limnologique de Besse). — Cf. Revue Inter. de l'Enseignement 39 128-31, Ann. Biol. Lacustre 1.1-32, Revue générale Scientifique 37 613-14, La Nature, Paris 64(2) 358-60, KOFOID 1910; LENZ 1927, Chronica Botanica 1939.

Cévennes **Laboratoire de Montagne de l'Aigoual** (Université de Montpellier): — According to Dr and Mrs VERDOORN, who visited this in 1932, without laboratory facilities.

Concarneau (Finistère, Brittany) **Laboratoire de Zoologie et de Physiologie Maritimes du Collège de France**: — Founded in 1859 by Prof. COSTE and now sponsored by the College of France at Paris. The purpose of the institution is to facilitate research in pure and applied marine biology. The 2-story building is well-equipped and the scientific work is under the direction of Dr R. LEGENDRE. — Cf. Nature 29 16-17, Ann. Soc. Belg. Micro. 28 1-44; Revue Scientifique 70 750-53; DEAN 1894; SAND 1898, KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

Dinard (Ille et Vilaine). **Laboratoire Maritime du Museum National d'Histoire Naturelle**: — At the mouth of the River Rance, with pronounced tides. Founded in 1882 and now sponsored by the National Museum of Natural History of Paris for research in oceanography and marine biology. The two buildings contain a public aquarium, marine museum, library, and research laboratories. The station is open from June to September. — *Station publication*: Bulletin du Laboratoire Maritime de Dinard (1928-). — Cf. La Nature, Paris 16(2) 186-88, Ann. Scient. Nat. Zool. 7(1) 1-46; SAND 1898; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

Endoume: **Laboratoire Marion de Marseille**: — Sponsored by the Faculty of Science of the University of Marseilles for instruction and research in marine zoology. The 3-story building contains a public aquarium, marine museum, classroom, and research laboratories. — *Station publication*: Travaux du Laboratoire de Zoologie et du Laboratoire Marion. — Cf. Ann. Musée d'Hist. Nat. Marseille 3 7-18; DEAN 1894; SAND 1898, KOFOID 1910, VAUGHAN 1937.

Le Croisic (Loire Inférieure): **Laboratoire de Biologie Maritime de Le Croisic**: — Accessible to sandy shores, salt marshes, and sand dunes. Founded in 1920 by Prof. ALPHONSE LABBÉ and now sponsored by the School of the Practice of Medicine and Pharmacy at Nantes. Station open to a maximum of eight investigators from July to September. — Cf. MAGRINI 1927; VAUGHAN 1937.

Le Lautaret (Hautes Alpes): **Institut de Botanique Alpine Marcel Mirande**: —

On a mountain pass in the western Alps at an elevation of 6,888 feet, the region containing about 2,000 species of plants. Founded in 1899 by Prof. LACHMANN and now sponsored by the University of Grenoble for the purpose of culturing alpine plants of different regions of the world and of studying their biology and propagation. There is a large alpine garden, a museum, library, and research rooms. The station is open from July first to September first. — *Cf.* Université de Grenoble Annales 32:1-31; *La Nature*, Paris 54(2):257-60.

Luc-sur-Mer (Calvados) : Laboratoire de Luc-sur-Mer de la Faculté des Sciences de Caen : — Founded in 1874, the building now contains research laboratories, library, and marine aquarium. — *Cf.* SAND 1898; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937

Montpellier (Hér) : Station Internationale de Géobotanique Méditerranéenne et Alpine : — Founded in 1930 by an international committee of botanists and now directed by Prof. J. BRAUN-BLANQUET for the study of geobotany and the methods of phytosociology and ecology. The building contains well-equipped laboratories, herbarium, and library. The station is open from September to July, with facilities for work especially in the Alps during the summer months. — *Station publications*: Communications de la Station Internationale de Géobotanique Méditerranéenne et Alpine, Montpellier (1930-); *Prospectus*; *Prodrome des Groupements Végétaux* (1931-). — *Cf.* *Rev. Bot. Appl. d'Agr. Col.* 10:1-4; *Chronica Botanica* 1935; *Ibid.* 1936; *Ibid.* 1938 (on the new building).

Orédon (Hautes-Pyrénées) : Laboratoire Biologique du Lac d'Orédon : — On the shore of a mountain lake at an altitude of 6,071 feet. Sponsored by the University of Toulouse to help scientific workers study mountain biology. The 2-story building contains laboratory and living accommodations. Open to investigators from July fourteenth to August thirteenth.

Roscoff (Finistère) : Station Biologique de Roscoff (Laboratoire Lacaze-Duthiers) : — Dedicated to research and instruction in marine biology and sponsored by the Faculty of Sciences of the University of Paris with an annual budget of 150,000 francs. Prof. CHARLES PÉREZ directs the work of the station, which consists of five buildings. These contain a herbarium, classroom, library, darkrooms, and well-equipped general and special laboratories. A 17-passenger bus and an 18-ton vessel, *Dundee*, are also attached to the station. Two courses are offered in marine biology. — *Station publications*: *Travaux de la Station Biologique de Roscoff* (1923-); *Conditions d'Admission*. — *Cf.* *Arch. Zool.* 1(3):1-38; *Ibid.* 1(6):311-62; *Ibid.* 1(9):543-62; *Nature* 29:16-17; *Arch. Zool.* 2(9):255-363; *Ibid.* 3(3):1-42; *Ibid.* 3(6):1-35; *Ann. Soc. Belge Micr.* 28:1-44; *Science* 28:479-80; *Int. Rev. Hydrobiol.* 1:282-88; *Ibid.* 2:493-97; *L'illustration* 86(1):393-95; DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937; *Bull. Soc. R. Bot. Belg.* 46:224-249 (especially on phycological facilities).

Sète (Hérault) : Station Biologique de Sète : — Founded in 1879 and now sponsored by the Institute of Zoology and General Biology of the University of Montpellier. The large, 2-story building contains a public aquarium, museum, classroom, library, living rooms, and several laboratories. — *Station publication*: *Travaux de la Station de Sète* — *Cf.* DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

Tamaris-sur-Mer: Station Maritime de Biologie de Tamaris : — Sponsored by the Faculty of Sciences of the University of Lyon in order to study the flora and fauna of the region of Toulon. The large, Mooresque laboratory building is open to investigators from March fifteenth to May first and from June twentieth to October twentieth. — *Cf.* *Bull. Soc. Amis de l'Univ. Lyon* 11:244-56; SAND 1898; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

Villefranche-sur-Mer (Alpes Maritimes) : Station Zoologique de l'Université de Paris à Villefranche-sur-Mer : — On the shores of the Mediterranean Sea with an exceptional pelagic fauna, both in abundance and variety. Sponsored by the University of Paris to aid in research on different problems of marine biology. There is a well-equipped building for laboratory work and living accommodations. A 4-ton motorboat is available. Vacation course in marine biology offered during Easter recess. — *Station publication*: *Travaux de la Station Zoologique de Villefranche-sur-Mer* (1925-). — *Cf.* *Arch. Sci. Phys. et Nat.* 12:1-11; *Ann. Soc. Belge Micr.* 28:1-44; *Int. Rev. Hydrobiol.* 10:317-19; DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

Wimereux (Pas-de-Calais) : Station Zoologique de Wimereux:— On the shore of the Straits of Dover and dedicated to research and instruction in zoology and botany. Established in 1874 by Prof. ALFRED GIARD and now sponsored by the Faculty of Sciences of the University of Paris with Prof. MAURICE CAULLERY as director. The laboratory buildings are open to investigators from April to October inclusive — *Station publications*: Bulletin Biologique de la France et de la Belgique; Travaux de la Station Biologique de Wimereux (1879-) — *Cf.* Revue Scientifique 4.217-22; Revue de l'Enseignement des Sciences 1:329-38; Revue du Mois 6:385-99; DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

— FRENCH INDO-CHINA —

Cauda (Nhatrang, Annam) : Institut Océanographique de l'Indochine:— In a region with rocky and sandy shores and coral reefs. Founded in 1922 and now sponsored by the Government-General of Indo-China for scientific researches in physical and biological oceanography and the establishment of a museum and aquarium. There is a well-equipped, 2-story building and the 147-foot research vessel, De Lanessan. — *Station publications*. Notes, Mémoires; Annual Report. — *Cf.* La Nature, Paris 65(1):452-53; MAGRINI 1927; VAUGHAN 1934; VAUGHAN 1937.

— GERMANY* —

Bellinchen a Oder Biologische Station Bellinchen:— Located on the Oder River for the purpose of instruction and research in ecology and related subjects. Courses are given in faunistics, floristics, and ecology.

Dümmersee (near Osnabrück) . Forschungshütte des Landesmuseum Hannover:— *Cf.* Chronica Botanica 1938.

Garmisch-Partenkirchen (Bayern) : Alpenlaboratorium auf dem Schachen bei Garmisch:— At an altitude of 6,232 feet, this institution is sponsored by the Bavarian Ministry for Instruction and Culture and the Union for the Protection of Alpine Plants for the culture and study of alpine plants. Dr. F. C. v. FABER directs the work of the station, which is open to research workers from June fifteenth to October first.

Hallstatt. Botanische Station in Hallstatt:— A private laboratory sponsored by Dr. FRIEDRICH MORTON for investigating the natural history of Hallstatt and vicinity. Investigators may make use of the station's facilities. — *Cf.* Chronica Botanica 1:84; *Ibid.* 2:76; *Ibid.* 5:256.

Helgoland: Biologische Anstalt auf Helgoland:— An independent institution under the direction of Prof. A. HAGMEIER. The large, 6-story building contains workshops, darkrooms, culture rooms, offices, library, public aquarium, herbarium, class laboratories, and many research laboratories. The 112-foot research vessel, Makrele, is attached to the station. Four courses are given in marine biology. — *Station publications* Helgolander Wissenschaftliche Meeresuntersuchungen (1937-); Ordnung für Vergebung und Benutzung der Arbeitsplätze; Lehrveranstaltungen der Biologischen Anstalt. — *Cf.* Zool. Anz. 15:290-92; *Ibid.* 16:124-27; Bot. Centralblatt 54:139-42; Rept. Smithsonian Inst. for 1893:505-19; Wiss. Meeresuntersuch., Abth. Helgoland 1:1-36, Verh. Deutsch. Zool. Ges. 6:177-82; Verh. Zool.-Bot. Ges., Wien 47:47-54; Mitth. deutsch. Seefischerei-Ver. 15:107-19; Zeitschr. d. Ver. Deutsch. Ingen. 47:807-12; Zeitschr. f. Bauverwaltung 25:470-72; Naturwissenschaften 6:569-72; Der Fischerbote 11:184-88; Int. Rev. Hydrobiol. 10:727-39; Cons. Intern. Expl. Mer, Rapports et Procès-Verbaux des Réunions 47(3):17-33; Der Biologe 7(3):161-83; Westermanns Monatshefte 157:513-20; DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

Helgoland: Vogelwarte Helgoland:— Situated on the only island in a large area of the North Sea and consequently a frequent stopping place for migrating birds. Founded in 1909 for investigating the migration and protection of birds and for instruction in ornithology. The 2-story building contains bird collections, offices, library, classroom, and laboratories. There are bird-traps for banding in the adjacent gardens. A course is offered in ornithology. — *Cf.* Der V. Internat. Ornithol. Kongress 1910:564-75; Brit. Birds 27:284-89; Der Biologe 3(7):184-86; Vogelzug 7:35-50.

* Territorial boundaries as of March 1938 (i.e., including Austria)

Husum (Schleswig-Holstein) · Zoologische Station.

Kiel Institut für Meereskunde der Universität Kiel:— Sponsored by the University of Kiel with Prof. A. REHMANN as director. The 3-story building contains a number of well-equipped laboratories — *Station publication*. *Kieler Meeresforschungen* (1936-37-). — *Cf.* *Kieler Meeresforschungen* 3:1-16; K. BRANDT, *Die beiden Meereslaboratorien in Kiel* (Conseil Perm. Int. pour l'Explor. de la Mer, 1926, pp. 16).

Kloster Hiddensee (Pommern): Biologische Forschungsanstalt Hiddensee:— Sponsored by the University of Greifswald and the Province of Pommern for instruction and research in the plant ecology and biology of the region. There is complete laboratory equipment, including an ornithological station. Vacation courses in ornithology, hydrobiology, and ecology are offered. — *Station publication*: *Hydrobiologischer und Ökologischer Ferienkursus auf Hiddensee* — *Cf.* *Chronica Botanica* 1:145-46.

Krefeld. Limnologische Station der Kaiser Wilhelm-Gesellschaft:— Sponsored by the Kaiser Wilhelm-Gesellschaft and the City of Krefeld for the limnological examination of the lower Rhine waters. — *Station publication* *Natur am Niederrhein*. — *Cf.* *Zool. Anz.* 80:336; *Int. Rev. Hydrobiol.* 22:128, *Der Naturforscher* 6(3):1-8; *Chronica Botanica* 1936, *Ibid.* 1938.

Langenargen Institut für Seenforschung und Seenbewirtschaftung der Kaiser Wilhelm-Gesellschaft:— Located on the shore of Bodensee and sponsored by the Kaiser Wilhelm Institute for the purpose of freshwater investigation and instruction. Dr. HANS-JOACHIM ELSTER is director of the Institute, which is housed in a 3-story building. A 3-week course in limnology is offered each July. — *Cf.* *Rivista di Biologia* 2:550-52, *Int. Rev. Hydrobiol.* 9:235-36; *Ibid.* 15:258-63, *Der Biologe* 4:134-37; *Arch. Hydrobiol.* 33:164; *Int. Rev. Hydrobiol.* 38:512, *LFNZ* 1927, RICKER 1937.

Lunz-am-See · Biologische Station Lunz (Kupelwiesersche Stiftung) — On the shores of Lunz Lake, a typical sub-alpine lake at an elevation of about 2,000 feet. Sponsored by the Academy of Sciences of Vienna and the Kaiser Wilhelm Institute for instruction and research in fresh-water and alpine ecology. Founded in 1906 by Dr. KARL KUPFLWIESER and now directed by Dr. F. RUTTNER. The 2-story building contains work-shops, greenhouses, darkrooms, offices, library, and many laboratories. A 3-week course in hydrobiology is given each summer. — *Cf.* *Die Umschau* 10:944-47; *Biol. Zbl.* 26:463-80; *Arch. Hydrobiol.* 2:465-99; *Int. Rev. Hydrobiol.* 1:297-99; *Ibid.* 13:213; *Ibid.* 29:148-54; *Naturwissenschaften* 2:313-21, KOFOID 1910, JUDAY 1910; LENZ 1927; RICKER 1937, Abderhalden's *Handb.* 9, 2.

Plön (Holstein) Hydrobiologische Anstalt der Kaiser Wilhelm-Gesellschaft:— Located in a moraine lake district and dedicated to research in hydrobiology and limnology. Founded in 1892 by Dr. OTTO ZACHARIAS and now sponsored by the Kaiser Wilhelm Institute with Dr. A. THIENEMANN as director and Dr. FR. LENZ as director of scientific work. There is a well-equipped, 3-story building and a 32-foot motorboat — *Cf.* *Zool. Anz.* 3(11):18-27; *Ibid.* 3(12):600-04, 655-56; *Verh. Ges. deutsch. Naturf. Ärzte* 63(11):120-21; *Rev. biol. du Nord France* 4:146-49, *Zool. Anz.* 15:36-39; *Int. Rev. Hydrobiol.* 1:507-09; SAND 1898, SCOURFIELD 1905, JUDAY 1910; KOFOID 1910, LENZ 1927; RICKER 1937.

Rossitten (Kurische Nehrung, Ostpreussen) Vogelwarte Rossitten der Kaiser Wilhelm-Gesellschaft:— On a great "migratory bridge" for birds near the Baltic Sea. Founded in 1901 and now sponsored by the Kaiser Wilhelm-Gesellschaft for research and instruction in ornithology. Dr. ERNEST SCHULZ directs the work of the station, which is housed in four buildings and three field annexes. An elementary course in ornithology is offered early in October — *Station publications*: *Der Vogelzug*; *Lehrgang der Vogelwarte Rossitten*. — *Cf.* *Der Biologe* 4:225-27; *Vogelzug* 9(2):70-90.

Saarbrücken Hydrobiologische Station:— *Cf.* *Int. Rev. Hydrobiol.* 10:549-50; *Rivista di Biologia* 4:401-02.

Secon (Chiemgau, Oberbayern) Biologisches Laboratorium Secon:— A private laboratory sponsored by Prof. R. WOLTERECK for faunistic studies on differentiation of animal races in lakes and related habitats. Open to foreign investigators from April first to November first — *Cf.* *Int. Rev. Hydrobiol.* 20:213-15.

Wasserburg (Bavaria) Biologische Station Wasserburg am Bodensee:— Sponsored by the Kaiser Wilhelm Institute (for some time directed by Dr. HELMUT GAMBS) for researches in limnology and related subjects. — *Cf.* *Int. Rev. Hydrobiol.* 15:144, LENZ 1927.

— GREENLAND —

Godhavn (Disko Island). Den Danske Arktiske Station:— Well within the Arctic Circle (latitude: 69° 14' N.) and near diversified arctic habitats. Founded in 1906 by MORTON P. PORSILD and now sponsored by the Government of Denmark for research in arctic science. The buildings contain good laboratory and living accommodations, a herbarium, and a library. Motorboats are available, as are sledges and camping equipment. The station is open throughout the year, being primarily a laboratory and not a base for travel. — *Station publication* Arbejder fra den Danske Arktiske Station — *Cf.* American Naturalist 39 505-06; Nature 108 320-21; Current History 16 637-41.

— HAWAII —

Honolulu: Marine Biological Laboratory of the University of Hawaii:— On the shore of Waikiki reef, a habitat rich in animal and plant forms. Established in 1920 and now sponsored by the University of Hawaii for instruction and research in marine biology. Prof. C. H. EDMONDSON directs the work of the station, the facilities of which are open to investigators between June and September. — *Cf.* Jour. Pan-Pacific Research Institute 6(2) 6-9, MAGRINI 1927; Turtlox 1937; VAUGHAN 1934; VAUGHAN 1937.

— HUNGARY —

Tihany Hungarian Biological Research Institute:— On the shore of Lake Balaton, the largest lake in Central Europe. Established for biological investigations of the organisms living in the lake and general biological researches independent of local questions and sponsored by the Hungarian Ministry of Education. The station has an annual budget of 35,000 pengo. There are ten resident investigators, with Prof. GEZA ENTZ as director. The 4-story laboratory building is unusually well-equipped. Extension courses are given for middle-school teachers in biology. — *Station publications* A Magyar Biológiai Kutatóintézet Munkái (Arbeiten des Ungarischen Biologischen Forschungs Institutes) (1927-), Prospectus (in English) — *Cf.* Ann. Biol. Lacustre 14 205-07, Arch. Balaton 1 1-14; Nature 120 968-69; Int. Rev. Hydrobiol. 13 370-72, *Ibid.* 18 435-36; Bull. Mus. Hist. Nat., Paris 33 468-69, Nature 121 93; LENZ 1927; Chronica Botanica 1935; *Ibid.* 1936.

— INDIA —

Calicut (South Malabar): West Hill Marine Biological Station:— On a narrow belt of low land lying between the sea and the lofty Western Ghat Mountains. Sponsored by the Madras Department of Fisheries for marine fishery research in general. — *Cf.* VAUGHAN 1937.

Ennur (Madras): Ennur Biological Station:— Sponsored by the Madras Department of Fisheries to supply biological specimens, although investigators may make use of the station's facilities. — *Cf.* VAUGHAN 1937.

Pamban (Krusadai Island, Madras): Krusadai Marine Biological Station:— The surrounding flora and fauna are among the richest in south India. Established in 1930 by the Madras Department of Fisheries for marine fishery research. The station is fairly well-equipped and there is the motor launch, The Pearl. — *Cf.* VAUGHAN 1937.

— ITALY —

Cagliari (Sardinia): Stazione Biologica:— *Cf.* Int. Rev. Hydrobiol. 12:434-35; KOFOID 1910, JUDAY 1910.

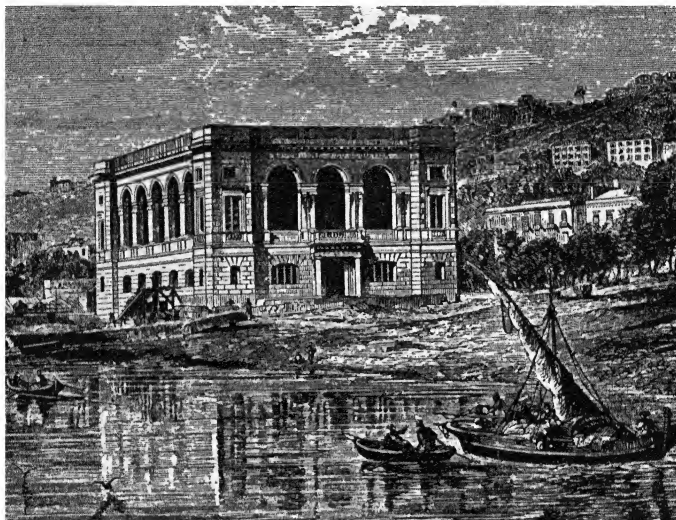
Col d'Olen (Alagna Sesia, Vercelli): Istituto Scientifico Angelo Mosso sul Monte Rosa:— In the Pennine Alps, at an altitude of 9,520 feet, with the cabin at Point Gnifetti at an altitude of 14,944 feet. Sponsored by the Royal University of Turin for scientific research in the mountains. The 3-story building contains laboratory and living accommodations. The institute is open during July and August. — *Station publication* Atti del Laboratorio Angelo Mosso.

Messina (Sicily): Istituto Centrale di Biologia Marina di Messina:— Sponsored by the Royal Italian Oceanographical Committee for research in marine biology. — *Sta-*

tion publications: Memorie Istituto Centrale di Biologia Marina di Messina; Bolletino Istituto Centrale di Biologia Marina di Messina.— *Cf.* Revue Scientifique 55:381-86; MAGRINI 1927; VAUGHAN 1937.

Monte del Lago (Umbria): **R. Stazione Idrobiologica del Lago Trasimeno:**— Founded in 1922 by Prof. OSVALDO POLIMANTI and now sponsored by the Italian Ministry of Agriculture and Forestry to investigate the flora and fauna of the region. There is a 2-story laboratory building and a 25-foot motorboat.— *Cf.* Int. Rev. Hydrobiol. 9:546-50; *Ibid.* 11:565; Rivista di Biologia 6:566-74; Věda Přírodní 8:44-47; LENZ 1927; Chronica Botanica 1936.

Naples: **Stazione Zoologica di Napoli:**— On the Bay of Naples and dedicated to any kind of biological research by qualified investigators from any nation. Founded



DOHRN'S INTERNATIONAL ZOOLOGICAL STATION AT NAPLES, A SHORT TIME AFTER THE COMPLETION OF THE ORIGINAL BUILDING (*contemporary woodcut*).

in 1870 by ANTON DOHRN, opened in 1874, with additions to building made in 1888 and 1903. Conducted as an autonomous institution with an annual budget of about 900,000 lire. Prof. REINHARD DOHRN heads the resident staff of five investigators. The 4-story building contains a public aquarium, supply department, public museum, dark-rooms, workshops, offices, library, herbarium, kitchen, and various kinds of well-equipped laboratories. The station can accommodate 65 investigators at one time.— *Station publications:* Pubblicazioni della Stazione Zoologica (continuing Mitteilungen aus der Zoologischen Station zu Neapel) (1916-); Fauna e Flora del Golfo di Napoli (1880-); Regulations for Prospective Investigators; Prezzi di vendita degli animali marini conservati; Guide to the Aquarium of the Zoological Station at Naples.— *Cf.* especially bibliography in KORON 1910; Nature 5:277-80, 437-40; *Ibid.* 6:362-63, 535-36; *Ibid.* 8:81; Science n.s. 1:479-81, 507-10; *Ibid.* 2:93-97; Nature 43:392-93; *Ibid.* 48:440-43; Science 1:238-39; *Ibid.* 3:16-18; American Naturalist 31:960-65; Science 5:832-34; Bot. Gaz. 23:278-82; Popular Science Monthly 59:419-29; Science 16:993-94; Die Umschau 2:116-18; Science 25:355-56; *Ibid.* 36:453-68; Popu-

lar Science Monthly 77:209-25; Science 52:323-25; Int. Rev. Hydrobiol. 10:739-40; Rivista di Biologia 5:788; Science 59:361; *Ibid.* 59:182-83; Rivista di Biologia 6:255-61; Int. Rev. Hydrobiol. 12:266-67; Science 61:585-86; *Ibid.* 63:271; Naturwissenschaften 14:412-24; Science 65:289-90; *Ibid.* 90:206; DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

Pallanza: Istituto Italiano di Idrobiologia Dott. Marco de Marchi:— Supervised by the Ministry of National Education for research in limnology.—*Cf.* Rivista di Biologia 25:438.

Piccolo San Bernardo (Aosta): Giardino Alpino "La Chanousia" e Lab. di Botanica Alpina "De Marchi":—*Cf.* Chronica Botanica 1:200; *Ibid.* 1:219.

Rovigno d'Istria: Istituto Italo-Germanico di Biologia Marina di Rovigno d'Istria:— Established in 1870 at Trieste by Dr. O. HERMES and moved to present site in 1891. Now sponsored by the Royal Italian Oceanographic Committee and the Kaiser



A VIEW OF THE HYDROBIOLOGICAL STATION AT THE LAGO TRASIMENO, UMBRIA, ITALY, SEEN FROM THE LANDING (drawing by V. Bauer).

Wilhelm Institute for instruction and research in marine biology, especially of the Adriatic Sea. The 4-story building contains a public aquarium, scientific sales department, museum, herbarium, offices, and research laboratories.—*Station publications:* Note (or Notizen) (1932-); Thalassia (1938-); Announcement; Liste der abgebbaren Seetiere und -pflanzen für wissenschaftliche Institute und den biologischen Unterricht.—*Cf.* Zool. Anz. 16:356-71; *Ibid.* 16:401-04; Int. Rev. Hydrobiol. 1:297; *Ibid.* 3:258-61; Die Naturwissenschaften 22:1-8; Rivista di Biologia 2:546-49; Int. Rev. Hydrobiol. 10:551; *Ibid.* 10:739-40; Science 58:9; DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

San Giuliano: Laboratorio di Biologia Marina per il Mare Ligure:— On the rocky beach of the Ligurian Sea. An autonomous institution owned by Professors ALESSANDRO BRIAN and RENATO SANTUCCI to aid in the study of marine biology.—*Cf.* Int. Rev. Hydrobiol. 5:179-80; Arch. Zool. Ital. 23(9-10); Rivista di Biologia 22:535-48; MAGRINI 1927; VAUGHAN 1937.

Taranto: Istituto Demaniale di Biologia Marina di Taranto:— Sponsored by the National Research Council of the Ministry of National Education for research in general marine biology. Prof. ATTILIO CERRUTI directs the work of the station, which is

housed in a 3-story, well-equipped building. The 33-foot vessel, *Galeso*, is available as are two motorboats and two sailboats. — Cf. *Rivista di Biologia* 3:379-90; *Int. Rev. Hydrobiol.* 10:196; *Ibid.* 29:294-95; *Rivista di Biologia* 15:386-90; MAGRINI 1927; VAUGHAN 1937.

— JAMAICA —

Cinchona **Botanical Gardens:** — At various times these gardens have been used as an American biological station. Cf. VERDOORN, 1945, "Plants and Plant Science in Latin America", p. xxi. "Many botanists of today do not know of the early efforts to found an American Tropical Laboratory (cf. *Bot. Gaz.* 22:415 and 494, 1896, etc.), culminating in the establishment of a tropical biological station (in 1903) at Cinchona, Jamaica (cf. MAYON 1922, *Smiths. Rept.* for 1920, p. 529, etc.). — Still much less is known today of the grandiose plans of LUIGI BUSCAGLIONI, who planned a second 'hortus bogoriensis' on the Amazon (ca. 1900), traveling widely to obtain sympathy and support (for a pathetic account of his efforts cf. *Nuovo Giorn. Bot. Ital.* 9:1-32, 1902). — A plan to establish a British tropical research station at Jamaica has recently been developed by V. J. CHAPMAN (*Nature* 152.47, 1943)".

— JAPAN —

Akkeshi **Akkeshi Marine Biological Station:** — On the sea front of the Gulf of Akkeshi with sandy beaches, rocky beaches, and a muddy bottom. Established in 1931 and sponsored by the Hokkaido Imperial University for research and instruction in biology. There is a 3-story building and a 26-foot motorboat, *Misago*. Course work is given in marine biology, marine invertebrate zoology, marine algae, experimental morphology, and physiology. — *Station publications:* Contributions from the Akkeshi Marine Biological Station; The Akkeshi Marine Biological Station (a guide printed in Japanese). — Cf. VAUGHAN 1937.

Asamushi (Aomori-ken) **Marine Biological Station of the Tohoku Imperial University:** — On the shore of Mutsu Bay, facing a shallow sea of about four fathoms in depth. Sponsored by the Faculty of Science of Tohoku Imperial University for research and instruction in marine biology. Founded in 1924 by Prof. SINKISHI HATAI and now directed by Prof. SANJI HOZAWA. The station contains a public aquarium, dormitories, library, classrooms, and well-equipped research laboratories. Three-week courses are given in marine biology, systematic botany, planktology, algology, comparative physiology, and seismology. — Cf. *Records of the Oceanographic Works in Japan* 1:26-38, VAUGHAN 1934; VAUGHAN 1937.

Fukushima (Kiso, Nagano Prefecture) **Kiso Biological Station:** — In a forested, mountainous region with torrential streams. Sponsored by Kyoto Imperial University to extend limnological researches to the life in streams and torrents.

Hunami-cho (Muran, Hokkaido) **Institute of Algological Research:** — Founded in 1933 and now sponsored by Hokkaido Imperial University for research work on marine algae. Prof. Y. TAMADA directs the work of the institute which maintains laboratory and living accommodations. — *Station publication:* Reports from the Marine Station for Algological Research (in Japanese). — Cf. *Chronica Botanica* 1935; *Ibid.* 1936; VAUGHAN 1937.

Kannonji (Otsu, Shiga-ken) **Otsu Hydrobiological Station:** — On Biwa Lake, the largest in Japan, with a central basin about 100 meters in depth and surrounded by various types of shores. Founded in 1914 and now sponsored by the College of Science of Kyoto Imperial University for research and instruction in limnology and allied subjects. The 2-story building contains library, aquarium, offices, and laboratories. Courses given in physiology and freshwater biology. — *Station publication:* Contributions from the Otsu Hydrobiological Station. — Cf. *Int. Rev. Hydrobiol.* 28:350; LENZ 1927.

Kominato Bay (Chiba Prefecture) **Kominato Marine Biological Laboratory:** — On the rocky shores of Kominato Bay, the depth being 100 kilometers within four kilometers from shore. Sponsored by the Imperial Fisheries Institute for research and instruction in marine biology. — Cf. VAUGHAN 1937.

Misaki (Kanagawa Prefecture) **Misaki Marine Biological Station:** — Founded in 1885 by the College of Sciences of the Imperial University of Japan and now spon-

sored by the Imperial University of Tokyo for research and instruction in marine biology, oceanography, and allied sciences. The plant contains dormitories, aquarium, museum, seismographic apparatus, and many laboratories. Summer courses given in marine zoology. — *Station publication* Journal of Faculty of Science, Section IV, Tokyo Imperial University. — *Cf.* Pop. Sci. Mon. 1904:195-204; SAND 1898, VAUGHAN 1934; VAUGHAN 1937.

Osshoro (Hokkaido): **Osshoro Marine Biological Station**: — *Cf.* VAUGHAN 1934

Seto-Kanayama (Wakayama-ken): **Seto Marine Biological Laboratory**: — Established in 1922 by Prof. IWAJI IKEDA of Kyoto Imperial University for research work in marine biology and for the instruction of students at Kyoto Imperial University. The Laboratory is well-equipped and includes the use of the 19-ton collecting vessel, Nyusin Maru. Courses are given in anatomy, experimental zoology, algology, and elementary oceanography — *Cf.* Records of Oceanographic Work in Japan 1(3):113-29; VAUGHAN 1934; VAUGHAN 1937.

Shimoda-machi (Shizuoka-ken) **Shimoda Marine Biological Station**: — Sponsored by the Tokyo University of Literature and Science for research and instruction. There is one laboratory building and several boats. Course work is given in zoology, botany, oceanography, and science education — *Cf.* VAUGHAN 1937.

Susaki (Kamogun, Siduoka Prefecture) **Mitsui Institute of Marine Biology**: — Adjacent tide pools and rocky strands abound in a rich fauna and flora. Established in 1933 by Mr. TAKANAGA MITSUI for the study of marine biology and to afford facilities for the research workers at the station. It is an autonomous institution with an annual budget of 25,000 yen. The 2-story building contains an aquarium, museum, library, and well-equipped laboratories. Fellowships are awarded annually by the station to research workers who desire to investigate marine material at the station — *Cf.* VAUGHAN 1937.

Tomuoka (Amakusa, Kumamoto Ken): **Amakusa Marine Biological Laboratory**: — Sponsored by Kyushu Imperial University. — *Cf.* Records of the Oceanographic Works in Japan 1(2):78-89; VAUGHAN 1934; VAUGHAN 1937.

— LATVIA —

Rīga: **Hydrobiologische Station der Lettländischen Universität**: — Founded in 1924 and now sponsored by the University of Latvia for research and instruction in hydrobiology. Prof. EMBRIK STRAND directs the work of the station, which is housed in one of the university buildings in Riga. There is a field annex at Kurland on Lake Usmaitenschen — *Station publication* Folia Zoologica et Hydrobiologica — *Cf.* Int. Rev. Hydrobiol. 12:435; *Ibid* 21:478-80, LENZ 1927; VAUGHAN 1937.

— MANCHUKUO —

Harbin: **Sungari River Biological Station**: — *Cf.* LENZ 1927.

— MARTINIQUE —

Fort de France. **Museum et Laboratoire Océanographique de M. Conseil**: — *Cf.* MAGRINI 1927.

— MEXICO —

Pátzcuaro (Michoacán): **Estación Limnológica**: — On Lake Pátzcuaro at an altitude of over 6,000 feet. Sponsored by the Division of Fisheries of the Department of Marine of the Mexican Government to investigate the facilities of the lake as a center of fishing and to make a general survey of the lake. Mr. MANUEL ZOZAYA is director and Dr. FERNANDO DE BUEN is scientific advisor. There are ample laboratory and living facilities. — *Cf.* The Collecting Net 15:202.

— MONACO —

Monaco-ville. **Musée Océanographique et Aquarium de Monaco**: — On the Mediterranean Sea, with the shore sloping abruptly to deep water, often 300 to 500 meters in depth within three miles from shore. Founded in 1899 by ALBERT I, Prince of

Monaco, for original research in marine subjects and public education in oceanography. It is an autonomous institution, being a part of the Institute of Oceanography at Paris. Dr. JULES RICHARD is director of the institution, which has an annual budget of 1,300,000 francs. The large, 4-story building contains a large public museum of oceanography, public aquarium, library, offices, darkrooms, and well-equipped laboratories. The 25-ton, 54-foot steamer, Eider, is available for collecting. The station is open from October first to July twenty-fifth. — *Station publications*: Bulletin de l'Institut Océanographique (1904-); Les Résultats des Campagnes Scientifiques de S.A.S. Prince Albert Ier de Monaco (1889-); Règlement Général Concernant l'Admission des Travailleurs faisant des Recherches; Musée Océanographique et Aquarium de Monaco (Guide Illustré). — Cf. Int. Rev. Hydrobiol. 1 504-07; Science 63.468-69; JUDAY 1910; KOFOD 1910; MAGRINI 1927; VAUGHAN 1937.

— MOROCCO —

Rabat: Institut Scientifique Chérifien: — Sponsored by the Direction of Public Education of Morocco for scientific research in French Morocco. Dr. J. DE LÉPINÉY directs the work of the station, which has an annual budget of 650,000 francs. — Cf. Chronica Botanica 1936.

— THE NETHERLANDS —

Abcoude: Laboratory of the Hugo de Vries Foundation: — Cf. LENZ 1927; Chronica Botanica 1935; *Ibid.* 1936.

den Helder: Zoölogisch Station der Nederlandsche Dierkundige Vereeniging: — At the mouth of the Zuiderzee, close to the large sandflat area of northern Holland. Founded in 1876 and now sponsored by the Netherlands Zoological Society and the Netherlands Ministry of Education, Arts, and Sciences for marine biological investigations in the widest sense of the term. Dr. J. VERWEY directs the work of the station, which has an annual budget of 12,700 guilders. The 2-story building contains a public aquarium, library, office, classroom, and well-equipped laboratories. There is also a building with living accommodations. The 43-foot vessel, Max Weber, is available for collecting. — Cf. Arch. Zool. 1(6) 312-19; Nature 29.16-17; Tijdschr. Nederl. Dierk. Vereen. 3:309-16; Feuille des Jeunes Natur. 19:17-19; Tijdschr. Nederl. Dierk. Vereen. 2(19) :21-45; DEAN 1894; SAND 1898; JUDAY 1910; KOFOD 1910; VAUGHAN 1937.

Wijster (Drenthe): Biologisch Station te Wijster: — In the most extensive heath- and moor-land district of the Netherlands. Founded in 1927 by Dr. W. BEIJERINCK and now sponsored by the Netherlands Biological Station, an autonomous institution. There is good equipment for field research. — The scientific work originating from the station is marked, Mededeelingen van het Biologisch Station te Wijster. — Cf. Botany in the Netherlands, Sixth Int. Bot. Congr. 1935:80; Vakil. Biol. 19(2) :17-25.

— NETHERLANDS EAST INDIES —

Batavia (Java): Laboratorium voor het Onderzoek der Zee: — Adjacent to salt- and brackish-water communities, coral reefs, and mangrove. Sponsored by the Netherlands East Indies Government and managed by the Botanical Gardens of Buitenzorg for scientific marine investigations. There are ample laboratory facilities. — Cf. Int. Rev. Hydrobiol. 10:195-96; Annales du Jardin Botanique de Buitenzorg 45:121-28; Natuurkundig Tijdschrift voor Nederlandsch-Indië 97:111-20; VAUGHAN 1934; VAUGHAN 1937.

Buitenzorg (Java): Treub Laboratory (Visitors' Laboratory) of the Govt. Botanical Gardens: — In the midst of the tropical lowland vegetation of 's Lands Plantentuin. Founded in 1884-85 by Prof. M. TREUB and now sponsored by the Botanical Gardens of Buitenzorg for use by foreign scientists who want to do laboratory work in the Botanical Gardens. — Cf. Bot. Ztg. 42:752-61, 768-80, 784-91; Pop. Sci. Mon. 67:579-89; Science 80:33-34; Ann. Jard. Bot. Buitenz. 45:1-60; Chronica Botanica 1935; *Ibid.* 1936; "Science and Scientists in the Netherlands Indies," p. 59, 1945.

Tjibodas (near Sindanglajja, W. Java): Mountain Gardens and Biological Laboratory of the Govt. Botanical Gardens: — Near the virgin forest (elevation between

4,500 and 9,800 feet). Founded in 1891 by Prof. M. TREUB and now sponsored by the Botanical Gardens of Buitenzorg. Laboratory and living accommodations are available. — *Cf.* *Revue générale Scientifique* 46:631-37, 664-68; *Chronica Botanica* 1935; "Science and Scientists in the Netherlands Indies," p. 403, *seq.*, 1945.

— NEW CALEDONIA —

Nouméa: **Marine Station**: — *Cf.* VAUGHAN 1934.

— NEW ZEALAND —

Portobello: **Portobello Marine Biological Station**: — Sponsored by the government of New Zealand for the study of New Zealand marine life. The buildings contain a public aquarium, library, scientific sales department, and laboratories. — *Cf.* VAUGHAN 1937.

— NORWAY —

Drøbak: **Universitets Biologiske Stasjon, Drøbak**: — Established in 1892 and now sponsored by the University of Oslo for marine research. Prof. HJALMAR BROCH directs the work of the station, which is housed in a 3-story building. Station open during July and August to students and investigators. — *Cf.* *Dtsch. med. Wschr.* 20 879; *Nyt Mag. Naturv.* 42:32; DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

Herdla. **Bergens Museums Biologiske Stasjon**: — Types of all prominent ecological habitats of the Norwegian Coast can be reached from this station within two hours. Founded in 1891 and now sponsored by the Bergen Museum for instruction and research in marine biology. Prof. AUGUST BRINKMANN is director of the station which has an annual budget of 25,000 Kroner. The 2-story building contains classrooms, living quarters, library, and several kinds of laboratories. The 48-foot vessel, *Herman Friele*, is available for research. — *Cf.* *Bergens Museums Aarsberetning* 1890(5):1-31; *Bergens Museums Aarbok* 1892(5):1-8; *Zool. Anz.* 16:217-20; *Int. Rev. Hydrobiol.* 1:299-300; *Nature* 111:358; *Science* 58:24-25; *Int. Rev. Hydrobiol.* 11:221; *Bergens Museums Aarbok* 1921-22(1):1-28; *Bergens Museums Aarsberetning* 1931-32:58-60; DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; VAUGHAN 1937.

Tromsø: **Biological and Hydrographic Laboratory of the Tromsø Museum**: — Established in 1930 by Mr. T. SOOT-RYEN and sponsored by the Tromsø Museum for scientific marine investigations in northern Norway. Space is available in the building of the Tromsø Museum and the 38-foot *Sparre Schneider* is available. — *Cf.* VAUGHAN 1937.

Trondheim: **Trondheims Biologiske Stasjon**: — An autonomous institution, subsidized by the Norwegian Government for the purpose of making hydrographical and biological investigations in the fiords and coasts of Norway. — *Cf.* *Ann. Mag. Nat. Hist.* 12:341-67; *Ibid.* 13:112-33, 150-64, 267-83; *Ibid.* 15:476-94; VAUGHAN 1937.

— PANAMA (CANAL ZONE) —

Gatun Lake: **Barro Colorado Island Biological Laboratory**: — On an island (six miles square with over 25 miles of shore line) largely covered with primeval rain forest (lower tropical zone). Established in 1924 and now sponsored by the Board of Directors of the Canal Zone Biological Area. Investigators desiring to visit the laboratory must obtain credentials from the Directors; this entitles them to secure steamship concessions, a pass on the Panama Railroad, and other privileges. — *Station publication*: *Annual Report of the Barro Colorado Island Biological Laboratory* (1926-). — *Cf.* *Science* 59:521-22; *Jour. Hered.* 15:99-112; *Nation's Health* 6(7):489-90; *Science* 62:111; *Report of the Smithsonian Institution for 1926*:327-42; *Science* 72:457; *Nature Mag.* 15:11-15; *Atlantic Monthly* 145:749-58; *Wilson Bull.* 42:225-32; *Bull. Pan-American Union* 67:43-51; *Entomologist* 66:217-21; *Travel* 63(2):15-19; *Revue des Deux Mondes* 25:30-34; *Survey Graphic* 24(4):192-93; *Scientific Monthly* 47:364-69.

— PHILIPPINE ISLANDS —

Puerto Galera (Island of Mindoro): **Puerto Galera Marine Biological Laboratory of the University of the Philippines**: — Sponsored by the Univ. of the Philippines

to provide biologists place and equipment for carrying out investigations on marine animals and plants. Mr. HILARIO A. ROXAS directs the work of the station, which offers both laboratory and living accommodations to students and investigators. — Cf. Int. Rev. Hydrobiol. 5:183; *Ibid* 6:325-34; VAUGHAN 1934; VAUGHAN 1937.

— POLAND —

Hel: Station Maritime de Hel: — Founded in 1932 and now sponsored by the Ministry of Public Instruction and the Ministry of Commerce. — Cf. Chronica Botanica 1936.

Pińsk: Poleska Stacja Biologiczna w Pinsku: — In a vast marshy plain among many slow-running rivers. Sponsored by the Nencki Institute of Biology to study the limnological problems of rivers and marshes. Dr. JERZY WISZNIEWSKI directs the work of the station, which is housed in a 2-story building. A vacation course in hydrobiology is given. — Cf. Archives d'Hydrobiologie et d'Ichthyologie 10(4) :31-34, 434-36; Chronica Botanica 1938.

Suwalki: Stacji Hydrobiologicznej na Wigrach: — On the shores of Lake Wigry, one of a group of more than 20 post-glacial lakes in the area. Sponsored by the Ministry of Education for the study of freshwater problems. Dr. ALFRED LITYŃSKI directs the work of the station, which has an annual budget of 30,000 zloty. A course is given in theoretical limnology — *Station publication*: Archiwum Hydrobiologii i Rybactwa (1926-). — Cf. LENZ 1927.

— PORTUGAL —

Dafundo: Aquário Vasco da Gama—Estação de Biologia Marítima: — Supported by the Fisheries Administration of the Ministry of Marine for general marine research on the coast of Portugal. There is a public aquarium, well-equipped laboratories, and the 135-ton research ship, Albacora. — *Station publication*: Travaux de la Station de Biologie Maritime de Lisbonne — Cf. MAGRINI 1927, VAUGHAN 1937.

Porto Station de Zoologie Maritime "Augusto Nobre".

— RHODES —

Rodi Istituto di Ricerche Biologiche in Rodi: — An island in the Aegean Sea at the eastern end of the Mediterranean. Founded in 1936 and now sponsored by several Italian governmental agencies for research in the oceanographical, biological, and chemical sciences. The modern, 2-story building contains a large public aquarium, museum, library, and research laboratories — Cf. VAUGHAN 1937.

— ROUMANIA —

Agigea Statiunea Zoologica Maritima "Regele Ferdinand I": — Sponsored jointly by the Roumanian Ministry of National Education and the Laboratory of Zoology of the University of Iași for investigating the fauna of the Black Sea and neighboring lakes. Prof. C. MORAS directs the work of the station, which is housed in a 2-story building. Station open from June first to October first. — *Station publication*: Lucrările Statiei Zoologice Maritime "Regele Ferdinand I" dela Agigea (1938-) — Cf. Ann. Soc. Univ. Jassy 19:1-16; Buletinul Soc. Natur. din România 11.1-6; Ann. Scient. de l'Univ. de Jassy 23(2) :1-4; VAUGHAN 1937.

Mamaia Statiunea Bio-oceanografica dela Mamaia.

Sinaia (Cumpatul): Statiunea Zoologica din Sinaia: — At an elevation of 2,788 feet in a forested zone with much rainfall. Sponsored by the Ministry of National Education for the study of the fauna and flora of the region of Mount Bucegi. Prof. A. POPOVICI-BAZNOSANU directs the work of the station, which is open from June first to November first. — Cf. LENZ 1927.

Stâna de Vale (Bihor): Statiunea Botanica Stâna de Vale: — Sponsored by the Botanical Institute of the University of Cluj for biological studies on the flora and vegetation of the Bihor Mountains and the cultivation of alpine plants at an altitude of 3,608 feet. A course is given in phytosociology. The station is open during July and August.

— SCOTLAND —

Millport (Buteshire) · **Marine Biological Station of the Scottish Marine Biological Association**:—Founded in 1884-85 by Sir JOHN MURRAY and now sponsored by the Scottish Marine Biological Association to investigate the flora and fauna of the Clyde Sea area and provide facilities for research and study for students and others interested in such work. RICHARD ELMHIRST directs the work of the station, which has an annual budget of £4,261. The 2-story buildings contain a public aquarium, museum, offices, storeroom for sales department, library, classroom, and many well-equipped laboratories. The 40-foot vessel, *M. B. Nautilus*, is available and is equipped with a laboratory for three persons. Several courses are given.—*Station publications*: Annual Report of the Scottish Marine Biological Association; Price List of Specimens.—*Cf* Jour. Marine Biol. Assoc. United Kingdom 1:218-43; Nature 72:456; JUDAY 1910; KOFOID 1910; MAGRINI 1927; VAUGHAN 1937.

— SPAIN* —

Chico · **Estación de Biología Marítima**.

Las Palmas (Canary Islands) · **Laboratorio Oceanográfico de Canarias**:—Sponsored by the Spanish Institute of Oceanography for the systematic investigation of the oceanographic and biological conditions in the vicinity of the Canary Islands —*Cf*. Instituto Espan. Oceanogr. Notas y Resúmenes 2(48) 1-79, VAUGHAN 1937.

Málaga. **Laboratorio de Málaga** — **Instituto Español de Oceanografía**:—Founded on the Strait of Gibraltar in 1914 by Prof ODÓN DE BUEN and now sponsored by the Spanish Institute of Oceanography for research in marine biology and oceanography —*Cf*. VAUGHAN 1937.

Palma (Island of Mallorca, Balearic Islands) **Laboratorio Oceanográfico de Palma de Mallorca**:—Founded in 1906-07 by Prof ODÓN DE BUEN and now sponsored by the Spanish Institute of Oceanography. The station is equipped with aquarium, museum, library, and several laboratories.—*Cf*. Bull. Soc. Zool. France 33:1-11; Int. Rev. Hydrobiol. 30 385-86; KOFOID 1910, MAGRINI 1927; VAUGHAN 1937.

San Sebastián · **Sociedad de Oceanografía de Guipuzcoa**:—*Cf*. MAGRINI 1927; VAUGHAN 1937.

Santander · **Laboratorio de Santander** — **Instituto Español de Oceanografía**:—Sponsored by the Spanish Institute of Oceanography to study the flora and fauna of the coastal regions of the Bay of Biscay —*Cf* KOFOID 1910, MAGRINI 1927; VAUGHAN 1937.

Valencia · **Laboratorio de Hidrobiología**:—*Cf*. Int. Rev. Hydrobiol. 7 272-73; LENZ 1927.

Vigo · **Laboratorio de Vigo** — **Instituto Español de Oceanografía**:—*Cf* VAUGHAN 1937.

— SURINAM (Neth. Guiana) —

Paramaribo · **Biological Station at the General Agricultural Experiment Station**:—Established in 1903 under the directorship of C. J. J. VAN HALL. The present director, Dr. G. STAHEL, is anxious to help visiting biologists. Modern laboratory facilities. *Cf* Bot. Gaz. 36:238-239, Bot. Cbl. 92 371; West-Ind. Gids, June 1920.

— SWEDEN —

Abisko · **Abisko Naturvetenskapliga Station**:—*Cf*. Chronica Botanica 1935.

Aneboda (Ugglehult): **Limnologiska Laboratoriet i Aneboda**:—Founded in 1907-08 and now sponsored by the University of Lund for research and instruction in limnology. A small, 2-story building contains apparatus for limnological research.—*Cf*. Int. Rev. Hydrobiol. 1:745-46; *Ibid.* 2 331-32; *Ibid.* 22:272; LENZ 1927.

Barsebäckshamn: **Barsebäckshamns Havsbiologiska Station**:—On the Öresund Sound, with brackish water on the surface and salt water beneath. Founded in 1914 and now sponsored by the Zoological Institute of the University of Lund for research and instruction in marine biology. A course in marine biology is given at the station, which is open to investigators during June, July, and August.—*Station publication*.

* As of June 1936.

Kungl. Fysiografiska Sällskapets Handlingar, Lund, Series: Undersökningar över Öresund. — Cf. Chronica Botanica 1936.

Fiskebäckskil: Kristinebergs Zoologiska Station:— Near the mouth of Gullmar Fiord, a relatively deep bay with a belt of islands near its mouth. Established in 1877 by Prof. SVEN LOVÉN and now sponsored by the Royal Swedish Academy of Science for research and instruction in marine zoology. Prof. EINAR LONNBERG directs the work of the station, which has an annual budget of 27,262 kronen. The equipment includes a library, aquarium, darkrooms, living accommodations, several laboratories, and the 42-foot motorboat, Sven Lovén. Course work in marine zoology is given. — Cf. Natural Science 7(6):407-16; Ark. f. Zool. 4(5):1-136; Popular Science Monthly 76:125-35; SAND 1898; JUDAY 1910; KOFOID 1910; Chronica Botanica 1936, VAUGHAN 1937.

Fiskebäckskil: Klubbans Biologiska Station:— At the mouth of the Gullmar Fiord (with a maximum depth of 394 feet) on the coast of the Skagerak. Established by the University of Uppsala for instruction of university students in marine zoology. Prof. SVEN EKMAN directs the work of the station, which is solely to offer course work in marine zoology to university students. — Cf. VAUGHAN 1937.

Göteborg: Oceanografiska Institutionen vid Göteborgs:— Sponsored by the Royal Society of Göteborg for research and instruction in physical oceanography and related sciences. Dr. HANS PETTERSSON directs the scientific work of the station, which is housed in a new, 2-story building. Special equipment includes a hydrodynamic tank (17 × 2 × 1 meters) and a plankton shaft (2 meters in diameter and 12 meters in length). The station is not open during July and August. — *Station publication:* Meddelanden från Oceanografiska Institutet vid Göteborg (1939-). — Cf. Nature 145:698; VAUGHAN 1937.

— SWITZERLAND —

Bourg St. Pierre (Valais): La Linnaea—Jardin et Laboratoire Alps:— In a valley of the Alps at an altitude of 5,576 feet, the region containing a mixture of both an arctic and Mediterranean flora. Founded in 1883, and now sponsored by the Institute of General Botany of the University of Geneva for research and instruction in alpine botany. Prof. FERDINAND CHODAT directs the work of the station, which consists of a botanical garden with 2,000 species of alpine plants and a laboratory building. A course is given in the botany of the Alps. The station is open during July and August. — *Station publication:* La Linnaea—Jardin et Laboratoire Alps (an announcement in French) — Cf. Chronica Botanica 1936

Davos: Hydrobiologisches Laboratorium der Landschaft Davos:— Cf. LENZ 1927; Chronica Botanica 1936.

Interlaken: Alpengarten und Laboratorium "Schynige Platte":— Cf. Chronica Botanica 1935.

Jungfrauojoch (Bernar Oberland): Hochalpine Forschungsstation Jungfrauojoch:— In a high, mountainous region at an elevation of 11,340 feet. Established by an autonomous council to enable research work in all branches of science to be carried out under the best possible conditions in a high mountain region. Prof. A. V. MURALT directs the work of the station, which has an annual budget of 24,000 Swiss francs. The 5-story building constructed in solid rock contains living quarters, darkrooms, library, lecture-room, workshop, and several well-equipped laboratories. Application for permission to work at the station must be made through one of the participating societies (Schweizerische Naturforschende Gesellschaft; Kaiser Wilhelm-Gesellschaft, Berlin; Université de Paris; Royal Society, London; Akademie der Wissenschaften, Wien; Fonds National de la Recherche Scientifique, Bruxelles; Rockefeller Foundation, New York; and Jungfrauobahn-Gesellschaft, Berne). Investigators whose applications are approved receive a reduction in railway fares and exemption from customs duty on consignments of scientific apparatus entering Switzerland. — *Station publication:* Information and Regulations. — Cf. Chronica Botanica 1935.

Kastanienbaum (Horw): Hydrobiologisches Laboratorium der Naturf. Gesellschaft Luzern:— Cf. Arch. f. Hydrobiol. 10:113-18; Int. Rev. Hydrobiol. 9:236; Chronica Botanica 1935; *Ibid.* 1939; LENZ 1927.

Zürich: Geobotanisches Forschungsinstitut Rübel:— Established in 1918 by Dr. E. RÜBEL and now an autonomous institution for studies in plant taxonomy and ecology. The headquarters and equipment are at Zürich, but the course in the ecology of alpine

vegetation is given at Davos. — *Station publications*: Bericht über das Geobotanische Forschungsinstituts Rübel in Zurich; Veröffentlichungen des Geobotanischen Forschungsinstituts Rübel in Zürich.

— TUNISIA —

Salammbo: Station Océanographique de Salammbo: — Sponsored by the Direction Générale des Travaux Publics in Tunis to investigate the marine organisms along the coast of Tunisia. The equipment includes a public museum and aquarium, library, and several laboratories. — *Station publications*: Notes de la Station Océanographique de Salammbo; Bulletin de la Station Océanographique de Salammbo; Annales de la Station Océanographique de Salammbo; Illustrated Catalogue of the Museum and Aquarium. — Cf. Science 63:488; MAGRINI 1927; VAUGHAN 1937.

— UNION OF SOCIALIST SOVIET REPUBLICS —

Alt-Peterhof. Hydrobiological Section of the Scientific Institute at Peterhof: — Sponsored by the Ministry of Education for hydrobiological and hydrochemical investigation of animals — *Station publication*. Travaux de l'Institut des Sciences Naturelles de Peterhof (1925-). — Cf. Chronica Botanica 1936; LENZ 1927.

Archangel: Algological Research Station: — Cf. Chronica Botanica 1936.

Cherson: All-Ukrainian Scientific-Practical Station of the Black and Asov Seas: — Founded in 1918 and now sponsored by the Ministry of Agriculture of the Ukraine Republic. — *Station publications*: Bulletin der Allukrainischen wissenschaftlich-praktischen Staatsstation des Schwarzen und des Azowschen Meeres; Arbeiten der Allukrainischen wissenschaftlich-praktischen Staatsstation des Schwarzen und des Azowschen Meeres (1925-). — Cf. LENZ 1927.

Elenowka (Armenia): Sewan Lake Station: — On Lake Goktscha in the Caucasus Mountains. Sponsored by the Ministry of Agriculture of the Armenian Republic for theoretical and practical investigations of Lake Goktscha. — *Station publication*: Arbeiten der Sewansee Station — Cf. LENZ 1927.

Kossino: Biological Station at Kossino: — Founded in 1908 and now sponsored jointly by the Moscow Society of Nature Research and the Ministry of Education for theoretical investigations in biology. Prof. L. ROSSOLIMO directs the work of the station, which is housed in a 2-story building. — *Station publication*: Arbeiten der Biologischen Station zu Kossino (1924-). — Cf. Int. Rev. Hydrobiol. 17:386-87; Ibid. 25:303-04; Progressive Fish Culturist 34:12-14; LENZ 1927.

Kostroma. Biological Station of the Scientific Society for the Investigation of the Kostroma Region: — Founded in 1919 and now dedicated to theoretical research work on the Volga River. — *Station publication*: Arbeiten der Wissenschaftlichen Gesellschaft zur Erforschung des Lokalgebietes Kostroma. — Cf. LENZ 1927.

Krasnoyarsk (Siberia): Siberian Ichthyological Laboratory: — Sponsored by the Ministry of Agriculture for practical and theoretical investigations. — *Station publication*: Report of the Ichthyological Laboratory in Siberia. — Cf. Int. Rev. Hydrobiol. 11:391-92; LENZ 1927.

Lake Glubokoje: Hydrobiological Station on Lake Glubokoje: — Founded in 1888 and now managed by the Biological Station at Kossino for the Moscow Society of Naturalists. — *Station publication*: Arbeiten der Hydrobiologischen Station am See Glubokoje (1900-). — Cf. Trav. Soc. Imp. Acclim. 2:201-06; KOFOID 1910; LENZ 1927.

Maritui: Baikal Hydrobiological Station: — On Lake Baikal, one of the deepest lakes in the world (with a reputed depth of 4,725 feet). Sponsored by the Russian Academy of Sciences for theoretical and practical investigations. — *Station publication*: Arbeiten der Kommission für die Erforschung der Baikalsees — Cf. LENZ 1927.

Mount Elbrus (Caucasus): Institute of Research in High Altitudes: — Cf. Science 87:550.

Murman: Biological Station of the Academy of Sciences of the U. S. S. R. at Murman: — On the Arctic Ocean which, owing to the penetration of the warm waters of the Atlantic, has an extremely rich and diverse fauna. Established in 1881 near Archangel, moved to near present site in 1899, and an announcement made in 1937 of plans to build a new station in the region to cost three and one-half million rubles. Sponsored by the Academy of Sciences of the U. S. S. R. with Prof. S. A. ZERNOV as

director. — Cf. Zool. Anz. 29:704-07; Ohio Naturalist 8:340-42; Int. Rev. Hydrobiol. 2:499-502; *Ibid.* 11:222-23; Science 67:158-59; *Ibid.* 85:536; Nature 139:725; DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; VAUGHAN 1937.

Murom, Vladimir: Oka Biological Station: — Founded in 1918 and now sponsored by the Ministry of Education for theoretical and practical biological investigations. — *Station publication:* Arbeiten der Biologischen Oka-Station (Murom-Russland). — Cf. LENZ 1927.

Novorossiisk: Novorossiisk Biological Station: — Sponsored by the People's Commissariat of Education to investigate the practical problems and objects of the Black Sea. Mr. W. A. WODJANITZKY directs the work of the station, which has an annual budget of 66,200 rubles. — *Station publication:* Arbeiten der Biologischen Noworossiisk-Station. — Cf. LENZ 1927; VAUGHAN 1937.

Otusy (Krim): Scientific Station of the Moscow Nature Research Society: — Cf. Chronica Botanica 1935.

Perm: Biological Station at Perm on the Kama River: — Sponsored by the Biological-Scientific Research Institute of the University of Perm. — *Station publication:* Bulletin de l'Institut des Recherches biologiques et de la Station Biologique à l'Université de Perm. — Cf. LENZ 1927.

Petrosavodsk: Borodin Hydrobiological Research Institute: — Cf. KOFOID 1910; LENZ 1927.

Preobrazenie (Siberia): Algological Research Station: — Cf. Chronica Botanica 1935.

Saratov: Volga Biological Station at Saratov: — Founded in 1900 and now directed by Dr. A. BEHNING for scientific investigation of the life of the Volga and educational work in hydrobiology. Course work is given to students. — *Station publications:* Arbeiten der Biologischen Wolgastation (1900-); Monographien der Biologischen Wolgastation (1924-). — Cf. Int. Rev. Hydrobiol. 3:461-62; *Ibid.* 5:581-93; Rivista di Biologia 5:789-90; Int. Rev. Hydrobiol. 13:111-13; *Ibid.* 17:357-61; Rev. Algol. 4:77-80; JUDAY 1910; KOFOID 1910; LENZ 1927.

Sevastopol: Sevastopol Biological Station: — Sponsored by the Academy of Sciences of the U. S. S. R. for oceanographical and hydrobiological observations of the Black and Asov seas. The 3-story building contains a public aquarium, library, darkroom, and several well-equipped laboratories. Course work is given to university students. — *Station publication:* Memoirs of the Sevastopol Biological Station. — Cf. Bull. Biol. 1:280-85; Int. Rev. Hydrobiol. 1:861-63; *Ibid.* 9:555; DEAN 1894; SAND 1898; JUDAY 1910; KOFOID 1910; VAUGHAN 1937.

Starosselje (Ukraine): Biological Station of the Dnieper: — Founded in 1907 and now sponsored by the All-Ukraine Academy of Sciences for theoretical investigation of the Dnieper basin. — *Station publication:* Travaux de la Station Biologique du Dnieper (1926-). — Cf. LENZ 1927.

Swenigorod: Hydrophysiological Station at Swenigorod on the Moskva: — Sponsored by the National Scientific Institute of the Ministry of Health for theoretical research on the Moskva River. Prof. S. SKADOWSKY directs the work of the station. — Cf. LENZ 1927.

Vladskavkaz (Caucasus): North Caucasus Hydrobiological Station: — Established in 1923 for theoretical hydrobiological investigation of alpine waters. — *Station publication:* Travaux de la Station Biologique du Cauc. du Nord (1925-). — Cf. LENZ 1927.

Vladivostok: Pacific Institute of Fisheries and Oceanography: — Near Ussuri Bay which is free from ice during the winter. Founded in 1925 under the direction of Prof. K. M. DERJUGIN and now sponsored by the All-Union Scientific Research Institution of Marine Fisheries and Oceanography for researches in the hydrology, hydrobiology, and ichthyology of the region. The plant contains a museum, aquarium, library, and several laboratories. — Cf. Int. Rev. Hydrobiol. 15:396-400; Fifth Pacific Science Congress 1:619-22; VAUGHAN 1934; VAUGHAN 1937.

— UNION OF SOUTH AFRICA —

Frankenwald: Botanical Research Station of the University of Witwatersrand: — Cf. Chronica Botanica 1939.

Sea Point: Marine Biological Station of the Division of Fisheries:—On the western side of the Cape Peninsula, with admirable opportunities for the study of marine flora and fauna. Established in 1939 by the Division of Fisheries of the Department of Commerce and Industry, being partially a continuation of the biological station founded in 1895 at St. James on False Bay. Dr. CECIL VON BONDE directs the work of the station, which has an annual budget of £13,000. The plant contains a library, darkroom, public aquarium, several laboratories, the 136-foot, 313-ton steam survey vessel, *Africana*, and a 50-foot motorboat, *Impala*.—*Station publications*: Annual Report of the Division of Fisheries; Investigation Reports.—*Cf.* VAUGHAN 1937.

— UNITED STATES OF AMERICA —

— Arizona —

Flagstaff: San Francisco Mountain Zoological Station:—At an altitude of 7,100 feet. Founded in 1926 by HAROLD S. COLTON and now sponsored by the Northern Arizona Society of Science and Art to form a center from which the biology, geology, ethnology, and archaeology of the Plateau of Northern Arizona may be studied. The station makes use of the facilities of the Museum of Northern Arizona. Open from June to September.—*Cf.* Science 69:132; Turttox 1932.

— California —

Angwin: Pacific Union College Field Nature School:—An itinerant field school, with headquarters at Pacific Union College. Prof. HAROLD W. CLARK directs the work of the school, which offers a course in field nature study every other summer.—*Cf.* Turttox 1937.

Corona Del Mar: Kerckhoff Marine Laboratory:—Sponsored by the California Institute of Technology for research in experimental embryology, physiology, marine ecology, biophysics, and chemistry to supplement that done at the sponsoring institution. Prof. G. E. MACGINITIE directs the work of the station, which is housed in a 2-story building.—*Cf.* VAUGHAN 1934; VAUGHAN 1937.

Dillon Beach: Pacific Marine Laboratory:—Founded in 1933 by the College of the Pacific for instruction and research in marine biology. Prof. ALDEN E. NOBLE directs the work of the station, which is open from June to September. Summer course work is given in general zoology and invertebrate zoology.

Laguna Beach (Orange County): Laguna Beach Marine Laboratory:—Founded in 1911 by Prof. C. F. BAKER and now sponsored by Pomona College for summer instruction in biology for undergraduate and graduate students. Prof. WILLIAM A. HILTON directs the work of the station, which is open during the summer months only. Summer course work is offered in the biology of vertebrates and invertebrates, human biology, human origins, and animal ecology.—*Cf.* Int. Rev. Hydrobiol. 7:134-35; Science 39:200-02; The Biologist 18 86-87; MAGRINI 1927; VAUGHAN 1934; VAUGHAN 1937; Turttox 1937.

La Jolla. Scripps Institution of Oceanography:—Within collecting range of the institution are long stretches of sandy shores interspersed with rocky reefs exposed to the open sea. Founded in 1892 by Dr. WILLIAM E. RITTER at Pacific Grove and moved to present site in 1905. Sponsored by the University of California for research and graduate instruction in oceanography and marine biology. Dr. HAROLD U. SYERDRUP directs the work of the station, which has an annual budget of \$110,000. The resident scientific staff consists of 12 persons. The equipment includes a public aquarium, 24 cottage residences, seismograph room, museum, offices, library, assembly room, many laboratories, a re-enforced concrete pier, and the 104-foot research vessel, *E. W. Scripps*. Course work is given in marine meteorology, physical oceanography, marine geology, chemical oceanography, marine microbiology, phytoplankton, marine invertebrates, marine biochemistry, and biology of fishes.—*Station publications*. Bulletin of the Scripps Institution of Oceanography of the University of California, Technical Series (1927-); annual reports on the activity of the institution appear in the Transactions, American Geophysical Union.—*Cf.* Harpers 110:456-63; Science 26:386-88; University of California Chronicle 9:1-7; Int. Rev. Hydrobiol. 1:863-65; University of California Publications in Zoology 9(4):137-248; Pop. Sci. Mon. 86:223-32;

School and Society 3:453-54, Science 63 297, Scientific Monthly 37:371-75; The Collecting Net 11(2) 1-5; The Biologist 18:87-96; MAGRINI 1927; VAUGHAN 1934; Turtox 1937; VAUGHAN 1937.

Norden (Placer County): San Francisco State College Science Field Session:—Sponsored by San Francisco State College to provide opportunity for study in one of California's most attractive localities. Summer course work is given in astronomy, geology, and the flora and fauna of the Sierra. No research facilities.

Pacific Grove: Hopkins Marine Station:—In the Monterey Bay region, with extraordinarily rich fauna and flora. Founded in 1892 as the Hopkins Seaside Laboratory by DAVID STARR JORDAN, CHARLES HENRY GILBERT, and OLIVER PEEBLES JENKINS. Now sponsored by Stanford University to undertake research in biology, to provide facilities for visiting investigators, and to furnish elementary and advanced instruction in biology. Prof. WALTER K. FISHER directs the work of the station. The equipment includes a small museum, marine shop, library, offices, darkrooms, and many well-equipped laboratories. Summer courses are given in the ecology of marine organisms, marine biology, marine invertebrates, marine fishes, marine algae, general microbiology, comparative physiology, physiology of marine plants, and experimental embryology.—*Station publication* Annual Bulletin of the Hopkins Marine Station.—*Cf.* Zee 4:58-63; Natural Science 11:28-35; Overland Monthly n.s. 32:208; Jour. Applied Microscopy and Laboratory Methods 5:1869-75; Pop. Sci. Mon. 86:223-32; Science 47:410-12; Int. Rev. Hydrobiol. 10:547-49; Science 62:76; Scientific Monthly 29:298-303; The Collecting Net 6:65-71; The Biologist 18 96-99, SAND 1898, MAGRINI 1927; VAUGHAN 1934; Turtox 1937; VAUGHAN 1937.

San Jose: West Coast School of Nature Study:—Founded in 1931 and sponsored by San Jose State College to better prepare teachers for the "nature in the classroom" type of teaching. Prof. P. VICTOR PETERSON directs the work of the school, which is almost wholly in the field, and changes its site frequently. There are no research facilities.—*Cf.* Turtox 1937.

Santa Barbara: Santa Barbara School of Natural Science:—Sponsored by Santa Barbara State College in order to offer popular summer field courses in nature study for California teachers. No research facilities are available.—*Cf.* TURTOX 1937.

Yosemite National Park: Yosemite School of Field Natural History:—The fauna and flora of the area are extensive, due to the wide range of topography and elevation (2,000 to 13,000 feet). Founded in 1925 by Dr. HAROLD C. BRYANT and sponsored by the U. S. National Park Service to train students in methods of interpreting living nature and to train naturalists for the National Park Service. Mr. C. A. HARWELL directs the work of the school, which offers a 7-week course in natural history during the summer months. Research facilities are not available.—*Cf.* School and Society 32:590-92; Nature Magazine 19 274, Turtox 1937.

— Colorado —

Cuchara Camps. Nature Enjoyment Camp:—At an altitude of 8,200 feet in the Rocky Mountains. Founded in 1939 and sponsored by the Huerfano Group of the Colorado Mountain Club to train leadership in methods of out-of-door teaching and nature guiding. No research facilities are available.

Gothic (Gunnison County): Rocky Mountain Biological Laboratory:—In an area comprising about a half million acres of virgin territory, with elevations ranging from 8,000 to 14,000 feet. Founded in 1927 and sponsored by the Rocky Mountain Biological Laboratory, Inc., for research and instruction in subjects best studied in high mountain areas. Dr. JOHN C. JOHNSON directs the work of the station, which consists of 15 buildings and staff residences. Summer courses are given in ecology, field botany, parasitology, and other biological sciences and geology. The laboratory is open from June twentieth to September first.—*Cf.* The Biologist 18:105-08; Turtox 1937.

Mount Evans: Mount Evans Laboratory:—At the summit of Mount Evans, 14,250 feet above sea level. Founded in 1936 and now sponsored by the University of Denver and the Massachusetts Institute of Technology to study high altitude phenomena. Prof. J. C. STEARNS directs the work of the laboratory, which is equipped

with both scientific and living facilities. The laboratory is open from June to October. — Cf. Science 31:220; *Ibid.* 87:431-32; Scientific Monthly 46:242-48

Nederland: Science Lodge:—On the flank of Mount Niwot, 9,500 feet above sea level, just below timberline and close to the continental divide. Sponsored by the University of Colorado for actual field experience in geology and biology. Summer courses are given in field biology and many phases of geology. The station is open from the third week of June to the fourth week of August — Cf. Univ. Colorado Bull. 17(1):1-14; Science 56:162-63; The Biologist 18:101-04; Turtlox 1937.

— Connecticut —

Lakeville: Science of the Out-of-Doors:—Established by Teachers College of Columbia University to give teachers guidance in the utilization of features in the natural phenomena of the out-of-doors. Prof. F. L. FITZPATRICK directs the work of this school, which offers a 4-week course in field work each summer. — Cf. The Biologist 18:109-10; Turtlox 1937.

— Florida —

Belle Isle (Miami Beach): Belle Isle Laboratory of the University of Miami:—Located on an island on the auto causeway connecting the cities of Miami and Miami Beach. Within an area readily accessible to the laboratory is found a wide variety of aquatic habitats and the Gulf Stream is only a short distance from land. Established by the University of Miami with Dr. F. C. WALTON SMITH as director. Ample laboratory accommodations for classes and independent investigators are available and living facilities may be obtained nearby. — Cf. Science 98:141-43.

Englewood: Bass Biological Laboratory:—On Lemon Bay which opens into the Gulf of Mexico. Founded in 1932 by the late JOHN F. BASS, jr. to furnish research facilities to investigators in biological fields where the fauna, flora, and climate play an important rôle in the problems under observation.

Pensacola: Gulf Coast Fisheries Laboratory:—Offshore the laboratory there are coral reefs and sand, mud, rock, and shell bottoms. Founded in 1937 and sponsored by the United States Fish and Wildlife Service for biological research on fisheries and related problems. Dr. A. E. HOPKINS directs the work of the laboratory. The equipment includes a library, museum, dormitory, residences, boat house, several kinds of laboratories, and several boats — Cf. Science 90:11; Proc. Fla. Acad. Sci. 4:175-78.

— Illinois —

Champaign University of Illinois Animal Ecology Study Trip:—An itinerant field station sponsored by the Department of Zoology of the University of Illinois. Established in 1936 for instruction in animal ecology. Prof. V. E. SHELFORD directs the work of the study trip, which offers no facilities to investigators.

— Indiana —

Winona Lake. Indiana University Biological Station:—Habitats available for study include mesophytic deciduous forests, a variety of glacial lakes in various stages of development and decay, and a medium-sized river. Founded in 1895 by Dr. C. H. EIGENMANN and now sponsored by Indiana University for research in most phases of fresh water biology and physics. Dr. WILLIAM E. RICKER directs the work of the station, which is open during June, July, and August. — Cf. Science 10:925-29; LENZ 1927; Turtlox 1937.

— Iowa —

McGregor: American Institute of Nature Study:—Founded in 1918 and now sponsored jointly by the Iowa Conservation Commission and the citizens of McGregor for instruction in nature study. Rev. GLENN W. McMICHAEL is executive director of the institute, which gives a 2-week course in nature study each summer. — Cf. Turtlox 1937

Milford: Iowa Lakeside Laboratory:—On West Okoboji Lake, of glacial origin and 132 feet deep with a shoreline of 18 miles. Founded in 1909 and now sponsored by a board of managers from several state and federal agencies for the purpose of studying the hydrology and biology of the State of Iowa. Prof. JOSEPH H. BODINE is

director of the laboratory. Research, instructional, and living accommodations are available. Summer courses are given in biology and protozoology. The station is open between the second week in June and the third week in August. — *Cf.* *Science* 49:466-67; *The Biologist* 18:114-22; LENZ 1927; Turtox 1937.

— Louisiana —

Grand Isle: Louisiana State University Field Laboratory:— On an island at the foot of Barataria Bay, west of the mouth of the Mississippi River, with a fine sand beach on the Gulf of Mexico and mud flats and marshes on Barataria Bay. Sponsored by Louisiana State University for instruction and research on Louisiana marine life. Prof. E. H. BEHRE is director of the laboratory, which consists of one building and a tent colony for living accommodations. Summer course work is given in marine zoology for advanced students and biology teachers. The laboratory is open during June and July. — *Cf.* Turtox 1937.

— Maine —

Damariscotta: Audubon Nature Camp:— Established by the National Audubon Society to offer adult leaders at low cost two-week sessions of ecological study guided by a highly competent and enthusiastic staff of specialists. Mr. CARL W. BUCHHEISTER directs the work of the camp which has an annual budget of \$13,000. Facilities are not available to research investigators. — *Cf.* *Bird Lore* 37:440-41; *Ibid.* 38:3, 36-37, 204-06, 288-92, 348-52; *Ibid.* 39:127-32, 366; *Natural History* 39:318-28; *Nature Magazine* 31:212-14; *Bird Lore* 40:120-22; Turtox 1937.

Lamoine: University of Maine Marine Laboratory: — Easy access to the unusually rich flora and fauna of the Gulf of Maine. Sponsored by the University of Maine to offer instruction in marine zoology. Prof. JOSEPH M. MURRAY is director of the laboratory, which is open from July first to September first. There are ample research, instructional, and living accommodations. Course-work is given each summer in marine invertebrate zoology. — *Cf.* *Science* 87:505; Turtox 1937; VAUGHAN 1937.

Salisbury Cove: Mount Desert Island Biological Laboratory:— Accessible to the Acadian fauna, with tides of eleven to fourteen feet. Founded in 1898 as the Harpswell Laboratory by J. S. KINGSLEY and now sponsored by the Mount Desert Island Biological Laboratory, Inc., to establish and maintain a laboratory for biological study and investigation in the State of Maine. Prof. WILLIAM H. COLE is director of the laboratory, which has an annual budget of \$8,000. Equipment includes dining hall, darkroom, library, shop, laboratories, and the 30-foot power boat, Dahlgren. Course work is given each summer in invertebrate zoology. The laboratory is open from June fifteenth to September fifteenth. — *Station publication:* Bulletin of the Mount Desert Island Biological Laboratory. — *Cf.* *Science* 17:983-86; *Popular Science Monthly* 74:504-13; *Int. Rev. Hydrobiol.* 4:537-39; *Science* 41:603-04; *Natural History* 22:47-55; *The Biologist* 18:123-26; *Science* 87:13; *Ibid.* 92:305; Turtox 1937; VAUGHAN 1937.

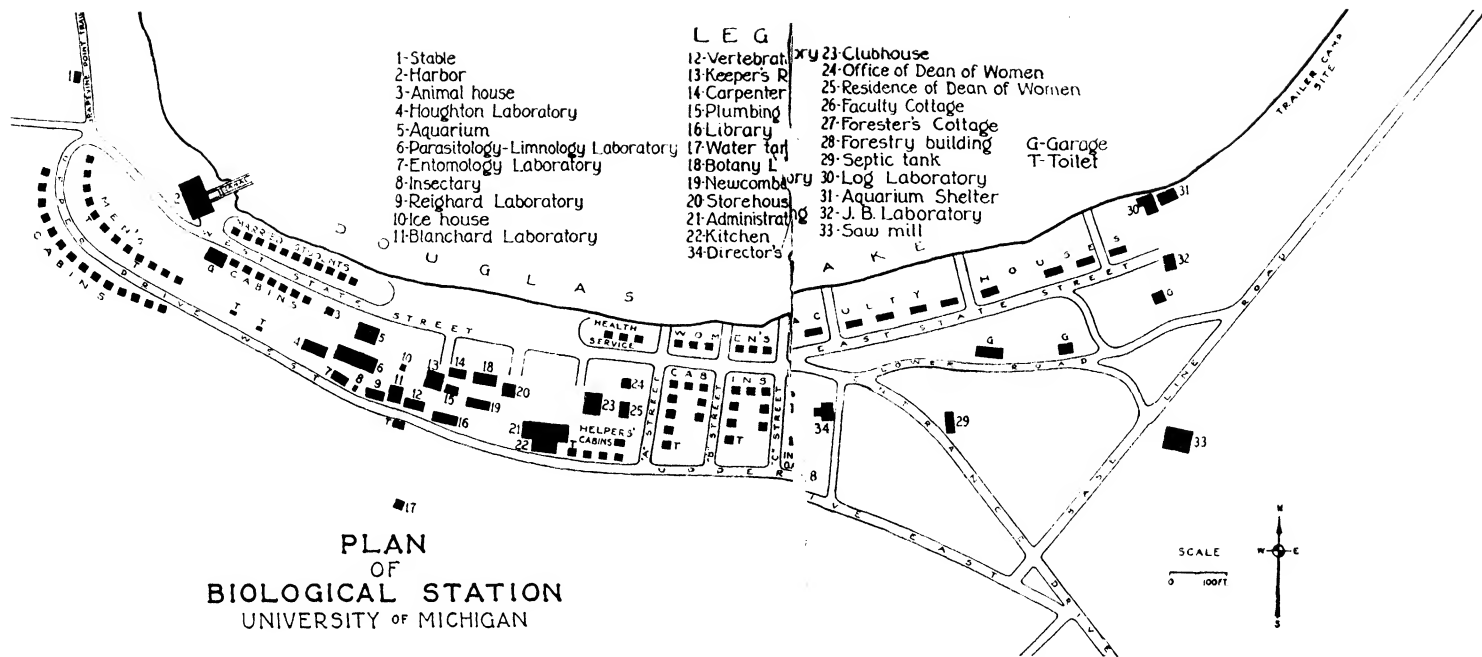
— Maryland —

Solomons Island: Chesapeake Biological Laboratory:— On the western shore of Chesapeake Bay at the mouth of the Patuxent River. Maintained by the State of Maryland as a research and study center where facts tending toward a fuller appreciation of nature may be gathered and disseminated. Prof. R. V. TRUITT is director of the laboratory, which has an annual budget of \$21,000. The two, 3-story brick buildings contain offices, museum, classrooms, library, living accommodations, and many well-equipped laboratories. Several types of boats are available. Summer courses are given in economic zoology, invertebrates, invertebrate embryology, and diatoms. — *Station publications:* Bulletin of the Chesapeake Biological Laboratory; Annual Report. — *Cf.* *Science* 76:205-06. *Ibid.* 85:513-14; *The Biologist* 18:127-34; Turtox 1937; VAUGHAN 1937.

— Massachusetts —

Plymouth: Nature Guide School:— Sponsored by Massachusetts State College to train outdoor leaders. Prof. WILLIAM G. VINAL is director and founder of the school, which offers a 6-week summer course in nature education. — *Cf.* Turtox 1937.

Woods Hole: Marine Biological Laboratory:— The fauna and flora are exceptionally rich, there being no muddy river or city sewage to pollute the sea water and



PLAN
OF
BIOLOGICAL STATION
UNIVERSITY OF MICHIGAN

A PLAN OF THE GROUNDS AND BUILDINGS OF THE BIOLOGICAL STATION OF THE UNIVERSITY OF MICHIGAN AT CHEBOYGAN LAKE, MICHIGAN (courtesy Univ. of Michigan).

the shore being varied by necks, points, flats, gutters, bays, and islands. Founded in 1888 as an outgrowth of the Annisquam Seaside Laboratory with Dr. C. O. WHITMAN as director. It is now an autonomous institution dedicated to the promotion of biological research by supplying investigators with facilities for their work and by offering courses which contribute to the training of investigators. Prof. CHARLES PACKARD is director of the laboratory, which maintains a summer staff of 44 professors. The plant includes a 4-story brick laboratory building, four wooden laboratory buildings, three buildings used by the supply department, carpenter shop, mess hall, club house, dwellings, and dormitories. These contain offices, dark rooms, balance rooms, X-ray rooms, auditorium, museum, many private and general laboratories, and a library, the latter containing 52,000 bound volumes, 130,000 reprints, and 1,300 current scientific periodicals. Summer courses are given in protozoology, invertebrate zoology, embryology, physiology, and the morphology and taxonomy of algae.—*Station publications*: Biological Bulletin (1899-); Annual Report.—*Cf.* Science 9:382-83; *Ibid.* 11:20-21, 305-06; *Ibid.* 12:37-38; Pop. Sci. Mon. 42:459-71; Science 7:37-44; *Ibid.* 12:233-44; *Ibid.* 16:529-33, 591-92; Smithsonian Report for 1902:625-32; Science 26:839-42; *Ibid.* 28:509-10; School Science and Mathematics 8:337-40; Nature 84:527-28; Int. Rev. Hydrobiol. 5:583-89; Hearst's Magazine 24:784-86; Outlook 107:767-68; Pop. Sci. Mon. 85:203-04; Science 40:229-32; *Ibid.* 58:142-43, 198; New Republic 36:178-79; Science 59:371-72; *Ibid.* 62:26, 271-80; School and Society 26:592-93; Scientific Monthly 27:186-90; Science 70:208-10; *Ibid.* 80:308; Scientific Monthly 39:377-80; The Biologist 18:135-39; Science 88:402; *Ibid.* 89:57-58; Turtlox News 18:93-94; Science 92:213; *Ibid.* 94:206; *Ibid.* 95:14; SAND 1898; Turtlox 1937; FRANK R. LILLIE: The Woods Hole Marine Biological Laboratory. University of Chicago Press, 284 pp., 1944.

Woods Hole: Woods Hole Oceanographic Institution:—The nearness of Woods Hole to the transition zone between inshore and oceanic waters, the abruptness of this

transition, and the nearness to the continental abyss and ocean basin all make this a particularly favorable headquarters for investigations into many of the basic problems in oceanography that are now engaging scientific attention. Founded in 1930 by an endowment from the Rockefeller Foundation on recommendation of the National Academy of Sciences. It is now an autonomous institution dedicated to the study of oceanography in all its branches. Prof. COLUMBUS ISELIN directs the work of the station, which has an annual budget of \$110,000. The 4-story building contains a constant temperature room, machine shop, offices, chart room, library, drafting room, darkrooms, and many well-equipped general and individual laboratories. Boats include the 142-foot research ship, Atlantis, and the 40-foot gasoline launch, Asterias. No instruction is offered, but a limited number of visiting investigators may be accommodated, either at the institution or on the Atlantis.—*Station publications*: Papers in Physical Oceanography and Meteorology (1933-); Collected Reprints (1933-); Report for the Year.—*Cf.* Jour. Conseil Int. Explor. Mer 5:226-28; VAUGHAN 1937; FRANK R. LILLIE, The Woods Hole Marine Biological Laboratory. University of Chicago Press, pp. 177-91, 1944.

—Michigan—

Clear Lake (Montmorency County): Michigan State College School of Field Biology:—Sponsored by Michigan State College to train teachers, undergraduates, and graduate students in biology. Prof. JOSEPH W. STACK directs the work of the school.—*Cf.* Turtlox News 18(2):40-42; Turtlox 1937.

Cheboygan: Biological Station of the University of Michigan:—On the shores of Douglas Lake, in the transition zone between the evergreen coniferous forest region to the north and the deciduous hardwood forest region to the south. Founded in 1909 and now sponsored by the University of Michigan for teaching and research in botany and zoology. Prof. ALFRED H. STOCKARD is director of the station, which has an

annual budget of \$16,500. The faculty consists of eleven professors. There is a well-equipped campus with excellent laboratory and living facilities. Each summer courses are given in the taxonomy of fresh-water algae, taxonomy of the bryophytes, systematic botany, plant anatomy, plant ecology, aquatic flowering plants, plant tissue culture and morphogenesis, entomology, ornithology, ichthyology, natural history of invertebrates, herpetology and mammalogy, limnology, and helminthology. The station is open from June twentieth to September first. — *Cf.* School Science and Mathematics 13:411-15; Science 47:381-83; *Ibid.* 49:466-67; Report of the Michigan Academy of Science, Arts and Letters 22:91-99; Science 57:412-13; The Collecting Net 6:169-73; The Biologist 13:130-37; *Ibid.* 18:140-48; LENZ 1927; Turtox 1937.

— Minnesota —

Itasca State Park: Lake Itasca Forestry and Biological Station: — On the east shore of Lake Itasca, with a diverse series of habitats furnishing a characteristic succession of plants and animals. Sponsored by the University of Minnesota for the advancement of terrestrial and fresh-water biology by means of promoting and providing opportunities for instruction and research. Prof. T. SCHANZ-HANSEN directs the work of the station. There are ample laboratory and living accommodations. Summer courses are given in field taxonomy (botany), field botany, elementary field ecology, bryophytes and pteridophytes, field research methods in ecology, field dendrology, field mycology, field entomology, wildlife conservation, parasitology, natural history of invertebrates and fishes, protozoology, limnology, and helminthology. The station is open from June to October.

— Mississippi —

Biloxi: Mississippi Delta State Teachers College Field Botany Trip: — Sponsored by Mississippi Delta State Teachers College to give instruction in field botany. Prof. R. L. CAYLOR directs the work of the trip, which is housed in a permanent camp on the shore of the Gulf of Mexico. A summer course in field botany is given. — *Cf.* Turtox 1937.

— New Hampshire —

Isles of Shoals: Isles of Shoals Marine Zoological Laboratory: — An excellent base for the study of marine life under a variety of conditions. Established in 1928 by Prof. C. FLOYD JACKSON and now directed by him for the University of New Hampshire. There are ample laboratory and living accommodations on the island. Summer courses are given in comparative anatomy, invertebrate zoology, histology-embryology, marine biology, laboratory technique, and the teaching of biology in secondary schools. The laboratory is open only during the summer months. — *Cf.* The Biologist 18:153-59; Turtox 1937; VAUGHAN 1937.

Nelson: Merriconn Biological Laboratory: — Founded in 1933 by Prof. PARKE H. STRUTHERS and now maintained by him as a private laboratory open to teachers and advanced students who wish to devote a part of the summer to increase their professional background and investigations in the field of biology. Laboratory and living accommodations are available. Summer courses are given in comparative anatomy, field zoology, and nature training. The laboratory is open to independent investigators from June fifteenth to September fifteenth. — *Cf.* The Biologist 18:111-13; Turtox 1937.

North Woodstock: New Hampshire Nature Camp: — In a high mountain valley about 1,800 feet above sea level. An autonomous institution under the sponsorship of Mr. LAWRENCE J. WEBSTER to train teachers and others in nature study and in various methods of imparting this knowledge to others. Dr. JARVIS B. HADLEY directs the work of the camp, which offers limited facilities to investigators. — *Cf.* Turtox 1937.

— New Mexico —

Las Vegas: Biology Field Courses of Texas Technological College: — At an altitude of 8,000 feet in a heavily timbered valley surrounded by rather high mountains and mesas. Founded in 1934 and sponsored by Texas Technological College to teach undergraduates biology. Dr. R. A. STUDHALTER is director of the station. Summer course work is given in general biology, although there are no facilities for investigators. — *Cf.* Turtox 1937.

— New York —

Cold Spring Harbor (Long Island): Biological Laboratory of the Long Island Biological Association:—The harbor is not exposed to the surf of Long Island Sound, the result being that marine animals and plants grow near the laboratory in great numbers. Founded in 1890 by Prof. FRANKLIN W. HOOPER with Dr. BASHFORD DEAN as director. The laboratory is now sponsored by an autonomous institution, the Long Island Biological Association, with an annual budget of about \$25,000. Dr. M. DEMEREC is director of the laboratory. The equipment includes technical shops, library, animal rooms, many kinds of laboratories, dining room, and dormitories. Summer courses were given in experimental surgery, experimental endocrinology, and marine and fresh water zoology. Each summer the laboratory invites a group of chemists, mathematicians, physicists, and biologists to take part in a 5-week symposium in some selected aspect of quantitative biology. The laboratory closely cooperates with the adjacent Dept. of Genetics of the Carnegie Institution.—*Station publications:* Cold Spring Harbor Symposia on Quantitative Biology (1933-); Annual Report — *Cf.* *Int. Rev. Hydrobiol.* 4:223-26; *Science* 59:332; *Ibid.* 63:419; *Rivista di Biologia* 12:150-58; *Science* 88: suppl. 10; *The Collecting Net* 15(1):1, 3-4; *SAND* 1898; *Turtox* 1937; *Science* 99 395-397.

[*Quaker Bridge: Allegany School of Natural History:*—After a short but influential existence, this institution was abandoned permanently in 1941.—*Cf.* *Science* 65:201; *Playground* 21:170; *School and Society* 27:598-601; *Ibid.* 28:106; *Ibid.* 31:197-98; *Elementary School Journal* 29:569-70; *Bird Lore* 35:125-28; *School Science and Mathematics* 38:67-71]

— North Carolina —

Beaufort. Duke University Marine Station:—Established by Duke University to study marine biology. Prof. A. S. PEARSE is director. There are three dormitories, a laboratory-building, a boat-house, a dining hall, and the caretaker's residence. Summer courses are given in algae, marine zoology, plant ecology, parasitology, and invertebrate zoology.—*Cf.* *Science* 87 454.

Beaufort. Fisheries Biological Station at Beaufort, North Carolina:—Easily accessible are a large variety of aquatic animals and plants, including those living in the open ocean, in brackish water, and in fresh water. Established in 1899 and now sponsored by the United States Fish and Wildlife Service for investigations of marine biology. Dr. HERBERT F. PRYTHORCH is director of the station, which has an annual budget of about \$17,000. The eight buildings contain a marine aquarium, museum, dormitory rooms, library, and several types of laboratories. Available boats include a 46-foot cruiser, a 33-foot boat, and an 18-foot outboard motorboat.—*Cf.* *Int. Rev. Hydrobiol.* 7:122-26; *Science* 69:547-49; U. S. Bureau of Fisheries Economic Circular 72; *MAGRINI* 1927; *Turtox* 1937; *VAUGHAN* 1937.

Highlands: Highlands Museum and Biological Laboratory:—Situated abreast of the Blue Ridge at an elevation of 4,000 feet. Established in 1927 and now an autonomous institution to promote, conduct, and maintain biological research in the southern Appalachian Mountains. Prof. W. C. COKER directs the work of the laboratory, which is open during July and August to investigators.—*Station publication:* Publications of the Highlands Museum and Biological Laboratory (1930-).—*Cf.* *Jour. Elisha Mitchell Scientific Society* 49:35; *Mycologia* 25:330-31.

— Ohio —

Put-in-Bay: Franz Theodore Stone Laboratory:—On an island in Lake Erie. Established at Sandusky in 1896 and moved to present site in 1918. Sponsored by Ohio State University in cooperation with the Ohio Division of Conservation and Natural Resources for the development of biological research and the application of its results to the welfare of humanity. Prof. THOMAS H. LANGLOIS directs the work of the station, which maintains a year-round scientific staff of seven persons. There is a well-equipped, 3-story laboratory building and also living accommodations. Summer courses are given in plant taxonomy, plant ecology, fresh water algae, higher aquatic plants, physiology of aquatic plants, advanced entomology, aquatic entomology, climatology, invertebrate zoology, aquaculture, ichthyology, animal parasitology, field

biology, advanced ornithology, herpetology, comparative physiology, and physiology of fishes.— *Station publication*: Contributions from the Franz Theodore Stone Laboratory.— *Cf.* Jour. Applied Micro. 6:2550-553; Science 49:466-69; The Biologist 18:149-52; Science 87:315-16; Turtox 1937.

— Oregon —

Coos Head: Oregon Institute of Marine Biology:— At the entrance to Coos Bay which contains wide stretches of tide-flats interspersed with sandy and rocky beaches. Sponsored by the Oregon State System of Higher Education for instruction and research in marine biology. Prof. EARL L. PACKARD is director. Summer course work is given in field zoology, biology of fishes, embryology of marine invertebrates, invertebrate zoology, taxonomy and ecology of marine algae, morphology of marine algae, systematic botany, paleobiology, and biological science survey. The Institute is open during June and July.— *Cf.* Science 85:240; VAUGHAN 1934; VAUGHAN 1937.

— Pennsylvania —

Bristol Township (Bucks County): Effingham B. Morris Biological Farm:— Sponsored by the Wistar Institute of Anatomy and Biology with Dr EDMOND J. FARRIS as executive director. Laboratory and living accommodations are available to qualified investigators.— *Cf.* Bull. Wistar Institute of Anatomy and Biology 8:1-31.

Huntingdon County: Pennsylvania State College Nature Camp:— Founded in 1923 by Prof. GEORGE R. GREEN and now sponsored by Pennsylvania State College to provide outdoor training and experience under expert field naturalists and to satisfy the demands of teachers and nature lovers for practical nature study and science field work. Ample living and laboratory facilities are available for summer course and research work in nature education.— *Cf.* Turtox 1937.

Presque Isle Peninsula (Erie County): University of Pittsburgh Lake Laboratory:— A peninsula in Lake Erie, with a continuous ecological series of ponds and marshes. Sponsored by the University of Pittsburgh as a field station for research and undergraduate instruction. Prof. O. E. JENNINGS is director of the laboratory, which is housed in a small, wooden building. Summer courses are given in field botany, nature study, field zoology, and entomology. The laboratory is open to investigators from the last week of June to the end of August — *Cf.* Turtox 1937.

— Rhode Island —

Narragansett: Narragansett Laboratory of Rhode Island State College:— On the shore of Narragansett Bay, in which the winter fauna is predominately boreal and the summer fauna is Virginian with a periodic influx of open ocean and gulf stream forms in late summer. Sponsored by the Rhode Island Division of Fish and Game and Rhode Island State College to offer facilities for marine research. CHARLES J. FISH directs the work of the laboratory, which contains good scientific equipment. The laboratory is open from June fifteenth to September first to investigators — *Cf.* VAUGHAN 1937.

— South Dakota —

Nemo: South Dakota State College Botany Summer Camp:— In the heart of the Black Hills with a diversity of biological habitats. Sponsored by the Botany Department of South Dakota State College for instruction and research in the taxonomy and ecology of the Black Hills flora. Prof. LEON C. SNYDER is director of the Camp, which is erected on land belonging to the National Forest Service. A summer course is given in the taxonomy of the Black Hills flora. Investigators may work at the camp between the second week of June and the third week of July.

Waubay: Lake Enemy Swim Biological Station:— Sponsored by Northern State Teachers College to offer the best possible opportunity to teachers, students, and investigators for the study and investigation of problems of the life sciences. Prof. SIDNEY R. LIPSCOMB directs the work of the station, which contains dormitories, dining hall, and a central laboratory building. Summer courses are given in natural science, animal biology, taxonomy of the flowering plants, plant anatomy, eugenics, and animal histology. No facilities are available to investigators.— *Cf.* Turtox 1937.

— Tennessee —

Reelfoot Lake: Reelfoot Lake Biological Station:— On the banks of Reelfoot Lake which was formed by an earthquake in 1815 and with the areas, therefore, definitely dated. Sponsored by the Tennessee Academy of Science to furnish opportunity for research to advanced investigators. Prof. CLINTON L. BAKER is director of the station, which consists of a well-equipped laboratory building. The station is open to investigators from June first to September fifteenth.— *Station publication* Report of the Reelfoot Lake Biological Station (1937-).— *Cf.* Jour. Tenn. Acad. Sci. 1:11-15; Science 76:208; Turtox 1937.

— Utah —

Utah Lake Brigham Young University Lakeside Biological Laboratory:— On a shallow, fresh-water lake with an area of about 75,000 acres. Sponsored by Brigham Young University to study the ecology of the flora and fauna of the lake. Prof. VASCO M. TANNER directs the work of the laboratory, which consists of one laboratory building.— *Cf.* Turtox 1937.

— Vermont —

Newfane Summer School of Bryology:— The hills of southern Vermont offer a moss and hepatic flora which is unusually abundant. Sponsored by the Long Island Biological Association to instruct students wishing to gain proficiency in the study of mosses. Prof. A. J. GROUT directs the work of the school, which contains a library, laboratory space, and a herbarium of 30,000 specimens. Summer course work of an informal nature is offered in bryology. The school is open to investigators from June to October.— *Station publication* The Moss Flora of North America, North of Mexico.

Randolph Green Mountain Nature Camp:— An autonomous institution directed by M. ELSIE OSGOOD to combine an invigorating, but restful vacation in the open with a chance to study nature first-hand. Informal course work is given during the summer in nature study. Research facilities are not available.

— Virginia —

Chester Virginia Natural History Institute Nature Leaders Training Course:— Founded in 1940 under the initiative of the National Recreation Association to provide training and practical field experience to leaders and prospective leaders for park, recreational, and camping agencies and educational institutions. REYNOLD E. CARLSON is director of the Course, which is given during the summer. Research facilities are not available.

Mountain Lake Mountain Lake Biological Station:— At an altitude of almost 4,000 feet, and within a radius of five miles collections can be made from places with a difference of 2,500 feet in altitude. Founded in 1929 and now sponsored by the University of Virginia to offer facilities for graduate instruction and research in the biological field to qualified students, teachers, and investigators from the Southern States. Prof. IVEY F. LEWIS is director of the station, which has an annual budget of \$11,000. Equipment includes a library, herbarium, museum, auditorium, darkrooms, culture rooms, offices, classrooms, dining hall, living cottages, dormitories, and trucks. Summer courses are given in the morphology of seed plants, plant taxonomy, phycology, mycology, protozoology, cell morphology, experimental morphogenesis, and hydrobiology. The station is open to investigators from June fifteenth to September first.— *Cf.* Science 80:112-13; Life 9:49-51; Turtox 1937.

Yorktown Virginia Fisheries Laboratory:— Within easy reach of the James River and only seven miles from the deeper waters of Chesapeake Bay. Established recently by the College of William and Mary and the Commission of Fisheries in Virginia in order to conduct investigations and give instruction in aquatic biology and conservation. Dr. CURTIS L. NEWCOMBE is director of the laboratory. While class-work is done mainly at Williamsburg, research requiring running sea-water is conducted at Yorktown. The 45-foot Agnes Hope is used for off-shore studies

— Washington —

College Place Walla Walla College Field Nature School:— Sponsored by Walla Walla College to afford an opportunity for students interested in nature to learn to

understand nature from first-hand observation. An itinerant school, pupils travelling every other summer 800 miles from the Blue Mountains in eastern Oregon down the Columbia River to Mount Rainier. Prof. HAROLD W. CLARK is director of the school, which does not offer research facilities.

Friday Harbor: University of Washington Oceanographic Laboratories:—The inland waters of the San Juan Archipelago and adjacent territory have a great variety and wealth of marine flora and fauna. Founded in 1904 and now sponsored by the University of Washington for independent research, directed research, and seminar and formal courses in the different phases of oceanography. Prof. THOMAS G. THOMPSON is director of the laboratories, which have an annual budget of \$15,000. The equipment includes seven laboratory buildings, stockroom, dining hall, living tents, cantilever pier, 50-foot power boat, Medea, and the 75-foot research vessel, Catalyst. There is also a 3-story laboratory building at Seattle. Summer courses are given in the physiology of bacteria, marine plants, physiology of marine plants, phytoplankton, oceanographic chemistry, physical oceanography, biochemistry of marine life, oceanographic meteorology advanced invertebrate embryology, and advanced invertebrate zoology. Research facilities are available during June, July, and August — *Station publications*: University of Washington Publications in Oceanography (1932-); University of Washington Publications in Oceanography, Supplementary Series (1931-). — Cf. Pop. Sci. Mon. 86:223-32; Science 69:331-32; Natural History 36:73-80; Jour. Chemical Education 13:203-09; The Biologist 18:160-70; MAGRINI 1927; VAUGHAN 1934; TURTOX 1937; VAUGHAN 1937.

Seattle: University of Washington Field Course in Botany:—An itinerant station sponsored by the University of Washington to acquaint students with the vegetation of North America and to give University of Washington botanists better access to the less well-known botanical regions of that area. Dr. C. LEO HITCHCOCK directs the work of this field course, which offers formal work in plant taxonomy during the summer. Independent investigators may accompany the course.

— West Virginia —

Morgantown: West Virginia University Biological Expedition:—An itinerant station sponsored by West Virginia University to complement the ordinary biological courses with outdoor laboratory work. Prof. P. D. STRAUSBAUGH directs the work of the expedition, which offers summer courses in botany and zoology. A limited number of investigators may be accommodated. — Cf. the Biologist 18:171-76; TURTOX 1937.

Oglebay Park: Oglebay Institute Nature Leaders Training School:—Sponsored jointly by Oglebay Institute, Wheeling Park Commission, and West Virginia University for practical instruction in the field for nature teachers and others. Mr. A. B. BROOKS directs the work of this school, which offers a series of summer courses in natural history. Research facilities are not available.

— Wisconsin —

Long Lake: Lost Lake Conservation Camp:—Sponsored by the nine State Teachers Colleges of Wisconsin and the U. S. Forest Service to give teachers and prospective teachers an opportunity to gain a practical knowledge of conservation and an extensive biological background which is essential for this. Prof. THORPE LANGLEY directs the work of the camp, which makes use of former C.C.C. lodges. Summer courses are given in field zoology, field botany, nature study, and conservation. Research facilities are not available.

Trout Lake: Trout Lake Limnological Laboratory:—Several hundred lakes are found within a radius of 25 miles from the laboratory. Sponsored by the University of Wisconsin and the Wisconsin Conservation Department to study the physics, chemistry, and biology of Wisconsin lakes. Prof. CHANCEY JUDAY is director of the laboratory, which has an annual budget of \$15,000. There are ample living and laboratory facilities. No course work is given, but independent investigators may work at the laboratory from June through September. — Cf. Trans. Wis. Acad. Sci., Arts, and Letters 25:337-52; The Biologist 18:177-82; TURTOX 1937.

Williams Bay: Geneva Lake Summer School of Natural Science:—An autonomous

institution dedicated to correlate theory and practice by giving students an opportunity for personal observation of the geological formations, plants, and animals of southern Wisconsin. Dr. ARTHUR D. HASLER is director of the School, which has good living and field laboratory facilities. Summer courses are given in plant ecology, advanced plant taxonomy, glacial geology, field geology, field zoology, limnology, survey of astronomy, and the teaching of science. Research facilities are available during the summer months. — Cf. Turttox 1937.

— Wyoming —

Centennial: University of Wyoming Science Summer Camp:— In the subalpine zone of the Medicine Bow National Forest at an altitude of 9,500 feet. Founded in 1923 and now sponsored by the University of Wyoming for field instruction and research in botany, geology, and zoology. Prof. S. H. KNIGHT is director of the camp. The equipment includes a central log lodge, four laboratory buildings, and forty lodging cabins. Summer courses are given in fresh-water algae, taxonomy of vascular plants, ecology, field and laboratory general botany, Wyoming birds, aquatic zoology, elementary field and laboratory zoology, elementary field course in geology, and advanced field geology. The camp is open to investigators from June fifteenth to August first. — Cf. The Biologist 18:183-89; Turttox 1937.

Jackson: Rocky Mountain Biological Station of the University of Michigan:— In a rugged mountain area, near the continental watershed. Sponsored by the University of Michigan Summer Session to conduct a general plant survey of the region and explore the possibilities of the region for biological study and research. Prof. LEWIS E. WEHMEYER is director of the station, which makes use of the summer engineering camp of the University of Michigan. No formal courses are given, but research may be undertaken during July and August.

— VENEZUELA —

Rancho Grande (Maracay): Biological Station of the New York Zoological Society:— This has recently been established. Dr. WILLIAM BEEBE writes (May 29, 1945): "As to the permanence of my Rancho Grande, I am only able to say that it looks as if it might be continued. I shall spend ten months next year here, and both the Venezuelan Government and the Creole People as well as our Zoological Society are anxious to have it kept up. I hope to get some of the native scientists trained to carry it on. I should say there is a very fair chance of its being carried on."

— YUGOSLAVIA —

Rab: Biological Station of the Czechoslovak Society for a Marine Biological Station:— Sponsored by the Czechoslovak Society for a Marine Biological Station to enable Czechoslovakian biologists to work in sea biology. There is one building which contains laboratory facilities. — *Station publication:* Travaux (1933-). — Cf. VAUGHAN 1937.

Split: Oceanografski Institut:— Sponsored by the Government of Yugoslavia for researches in oceanography and biology and instruction for students. Prof. A. ERCEGOVIĆ directs the work of the institute. Equipment includes a public aquarium, library, living accommodations, and 25 laboratories. Courses are given in marine biology. — *Station publications:* Acta Adriatica; Annual Report. — Cf. VAUGHAN 1937.

Struga: Die Hydrobiologische Abteilung der Antimalariastation zu Struga:— Cf. LENZ 1927.

Crna Mlaka (Zdenčina, Kroatien): Teichwirtschaftliche Versuchsstation:— Cf. LENZ 1927.

After this booklet had been completed I received word of the publication of an extensive biography of ANTON DOHRN by THEODOR HEUSS (Berlin und Zürich: Atlantis-Verlag, pp. 319, 1940). — This is a very fine volume, of great interest to all interested in the development and methods of organization of biological stations.



